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MODEL AIRPLANE NEWS

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P47 PARADE

Midwest's New Aerostar .40

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VOLUME 115, NUMBER 6 DECEMBER 1987

MODEL AIRPLANE NEWS

ON THE COVER:
TOP: Rich Uravitch's P-47 early-block D "Razorback" converted from a Top Flite kit (see page 60). Photo by Rich Uravitch.
BOTTOM: Beautiful "Bubble Top" D captured by the lens of Budd Davisson.
ABOVE: Twiliter II, another of Randy Randolph's proven designs.

FEATURES

CONSTRUCTION

COLUMNS

COLUMNS

DEPARTMENTS

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Editorial

by RICH URAVITCH

WE RECOGNIZE that there are a LOT of "real" airplane enthusiasts among our readers, some of whom, as hard as it may be to believe, have never built an R/C airplane. That's the reason we've done this "theme" issue on the Republic P-47 Thunderbolt. Budd's account should strap you in and take you around the patch. When back on the ramp and chocked, you may decide you want your own Jug, but on a slightly less grandiose scale. We've provided a broad spectrum guide which should enable you to recreate your favorite T-Bolt.

The Jug has always been one of my favorite machines...for lots of reasons, not the least of which are some of the "elder statesmen" I've met who belong to the P-47 Fighter Pilots Association and the P-47 Alumni Association. These are the guys who made it happen then, and are committed to insuring that the legacy of Jug will live on. Their ranks are thinning now but, hopefully, the baton will be passed and the legend perpetuated.

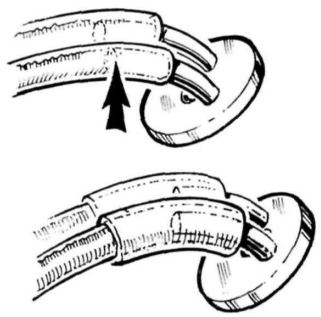
To the Bob Johnsons, Gabby Gabreskis, Henry Lederers, Erwin Hoenes, Butch Micalizzis and Tony Uravitchs of these organizations, along with the remainder of their ranks...we Jug Lovers, a generation or two behind you, salute your efforts. This one's for you, Hawk!!

Tabulation of the Design Contest ballots is underway, and the task can only be considered monumental. Seems nearly all of you want a shot at the Kyosho Planet ARF and the new Fox .40BB R/C engine that we're giving away when we draw a name from all those submitted ballots. Some of you have asked, so we'll answer the questions here. We will not release the full addresses of the fifty finalists until the contest is concluded, and only then if the finalist provides us with approval to do so. It seems that some of the designs are so enticing in the pictures that a good number of you would like to contact the designer right now to get a jump on the new project...sorry guys, just a little patience. ■

Hints & Kinks

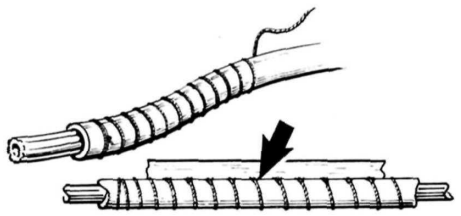
by JIM NEWMAN

Model Airplane News will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Hints & Kinks." Send rough sketch to Jim Newman, c/o **Model Airplane News,** 632 Danbury Rd., Wilton, CT 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO, AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we cannot acknowledge each one, nor can we return unused material.



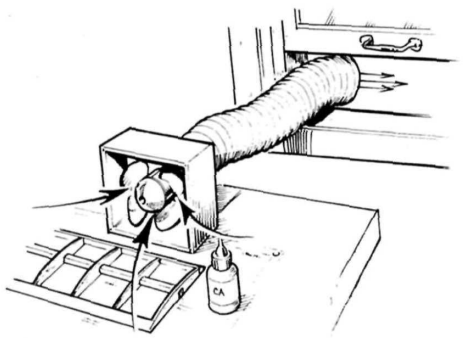
A common occurrence in fuel systems is a hole appearing in the fuel line just at the end of the brass tubing going into the tank, shown by the arrow. The remedy is quite simple—short lengths of the next larger size fuel line slipped over the tubes as shown, effectively reinforcing the fuel line where it joins the tubes.

Eugene Cunningham, Jackson, MO



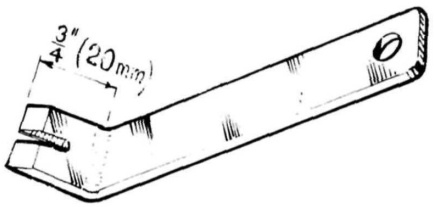
This is a neat way of attaching nylon pushrod tubes to fuselage sides without lots of weighty epoxy. Bind the tube with sewing thread as shown, place it against the fuselage side, then apply drops of cyanoacrylate glue where the thread touches the fuselage sides. Simple, strong and lightweight.

Dan Marshall, Boise, ID



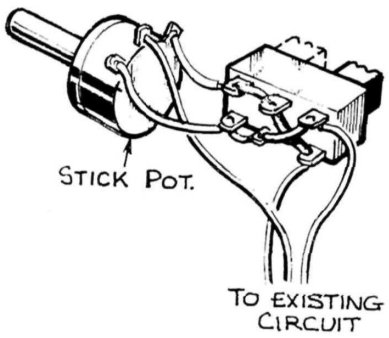
There are those who suffer agonies due to balsa dust and glue fumes and a simple solution is suggested here. Our friend purchased an inexpensive bathroom ventilating fan and a length of dryer flexible ducting. He stands the fan on the bench near his work and dangles the duct out of an open window. He says the fans are very quiet and do not affect his radio football commentaries!

Owen Williams, Seattle, WA



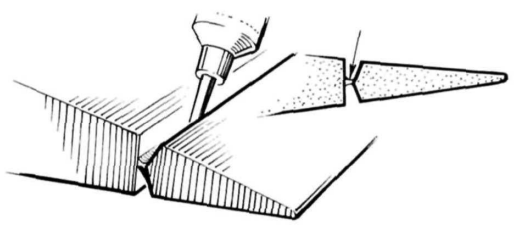
To open a clevis, most of us will reach for a screwdriver, and in confined spaces it is not the easiest tool to use. A piece of flat metal, 3/32"x1/2"x3" formed and bent 45 degrees creates an easy-to-use mini pry bar which quickly pops open the jaws of a clevis. The slot should be just wide enough to clear the clevis pin.

Wolfgang Geckler, Ammerbuch, West Germany



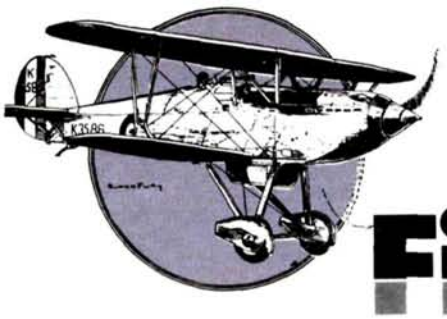
You don't have servo reversing switches on your transmitter? This modeler fitted his own by breaking into the leads from the stick potentiometers and fitting a changeover or ON-ON switch. These slide switches are available at Radio Shack.

William Lau, Napier, New Zealand



From Mr. Antique himself...render your aileron response much crisper and reduce drag due to air leakage at the same time. Run a thin bead of silicone adhesive or sealer in the gap between the ailerons and the wing. Then, smooth it with a suitable tool or a wet little finger. Joe says this idea can also be used as a hinge on small (.049 to .15) models.

Joe Beshar, Oradell, NJ



Fifty Years Ago...

by ART SCHROEDER

GAS-POWERED model airplanes continued to grow rapidly into model aviation's major facet. In "Gas Lines," the International Gas Model Aircraft Association's (IGMAA) monthly feature, the editor said, "Adults have gone crazy about gas models. We expect soon to see a large increase in the number of inmates in the insane asylum!" Our editor was underlining gas models as a dominant modeling force using a bit of tongue-in-cheek, but he spoke true words. The "war" against gas modeling based on purported safety problems, was over and "gassies" were here to stay. Soon after this issue, those states that had banned gas models rescinded their action. Contests, editorial space and advertising showed clearly that gas modeling had arrived. The stage was fully set for gas-powered radio-control aircraft.

It seems that each issue of *Model Airplane News* carried a construction article for gas models along with its many articles on full-scale, rubber-powered static, solid models, how-to and tech stuff. This month was no exception with Little Varmint a twin-tail, multi-stringered gas airplane for the Baby Cyclone engine. One look at the plans reveals a lot of parts in Varmint's airframe—and with cellulose glue as 1937's only modeling adhesive, airplanes such as this took a lot of workshop time. Imagine what modelers would have done for a bottle of cyanoacrylate fifty years ago! I perused this issue with great care to find a direct commercial link with *Model Airplane News'* November 1987 issue. It seemed that none could be found; all of modeling's 1937 manufacturing companies or sales outlets no longer exist, at least not in the same form as 50 years ago.

But I did find an interesting commercial connection on the editorial pages. In "Airways," a column on modelers around the world and in America, it was mentioned that James Horne was operating a workshop and supply house for modelers from his attic room. He was billed as "one of the youngest model airplane dealers in the country." Well, that young fellow, a modeling entrepreneur fifty years ago, is

A younger Jim Horne. Were it not a long time ago, that model could be a Robin Hood 80.

the same Jim Horne, operator of Historic Aviation that serves modelers today with just about any book that can be helpful. Jim never stopped helping modelers and furthering model aviation and he continues to this day.

In full-scale features, *Model Airplane News* published material on the 1937 National Air Races in Cleveland, all in conjunction with its Folkerts racer cover by the famed Jo Kotula. Any modeler beyond the age of forty will remember those Kotula covers filled with visual dynamics, color, speed, accuracy and newsstand appeal. Jo Kotula and *Model Airplane News* were synonomous for many years and we all enjoyed his work. He was aviation's top artist on model aviation's top magazine.

The Varmint, circa 1937. Lots of little pieces and no cyanoacrylate in sight!

Anyway, in the Thompson trophy event at the Cleveland Air Races, Rudy Kling won in the Folkerts on the 20-lap, 10-mile course at a speed of 256.9 mph, just ahead of Earl Ortman in a Keith rider and Roscoe Turner in a Turner Special. The Bendix (race from Los Angeles to Cleveland) was won by Frank Fuller in a Seversky racer at a speed of 258 mph. Greve Trophy Race (a 5-mile affair) was won by Rudy Kling with his Folkerts topping 232 mph. Air racing was in its hay day.

War clouds were building. Japan was already at war with China and *Model Airplane News* gave full information on attack aircraft that would possibly be involved in the looming certainty of World War II. Most of these airplanes did not make it, as aircraft design rapidly accelerated to meet the needs for high performance.

And through it all, *Model Airplane News* was there to keep modelers informed about their aviation world—full-scale or miniature.

We continue to do so in 1987.

Happy Holidays from "Fifty Years Ago"! ■

How To:

by RANDY RANDOLPH

MAKE AN OIL FREE SWITCH

Engine exhaust, with its oil content, is the enemy of all things electronic. Receivers, servos, and batteries are always on the inside of the airplane—the switch should be as well. The photos show a way.

1. Materials needed include: a piece of 1/8-inch by 3/4-inch plywood the same length as the inside width of the fuselage; some 1/8-inch by 1/16-inch balsa; a short length of inner nyrod, and a 6-inch length of 3/16-inch wire.

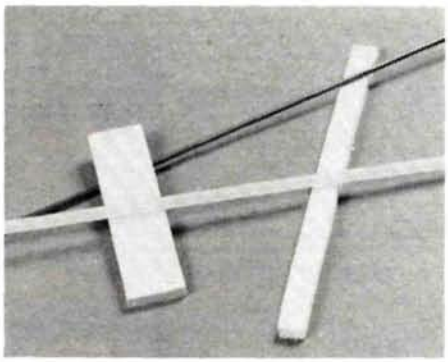
2. Measure the location of the mounting holes on the switch as well as the size and location of the slide window. For best accuracy, measure holes from the corresponding sides rather than from the centers.

3. To make the switch mount, lay out the switch, as measured, at the center of the 1/8-inch plywood. In the picture, the three dots in the center mark the middle and sides of the switch slide window.

4. Cut and drill the plywood switch mount. The switch window can be done most easily by drilling holes at opposite ends of the cutout, then finishing the opening with a razor knife using a #11 blade.

5. Drill a 5/32-inch hole through both fuselage sides 1/8-inch above the intended location of the switch mount plate. 5/32-inch is the size hole that fits inner nyrod.

6. Mount the switch and glue the switch mount in place between the 5/32-inch holes. Slide 1-inch lengths of inner nyrod through the holes from each side and, using 1/8-inch balsa pads between them and the mount, glue in place. Work the switch through the nyrods with the piece of 1/16-inch wire.



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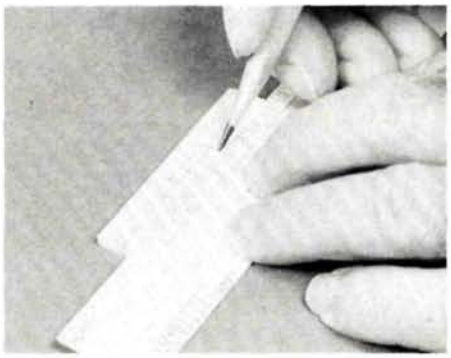

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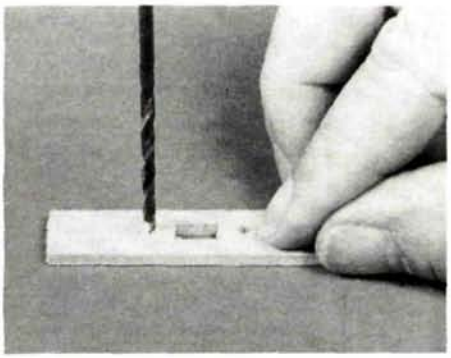

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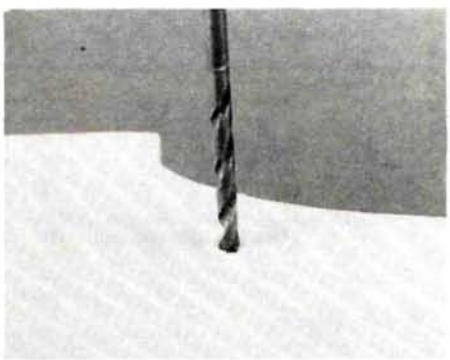

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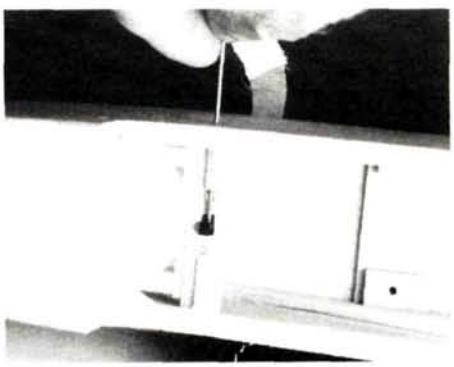

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Giant Steps

by DICK PHILLIPS

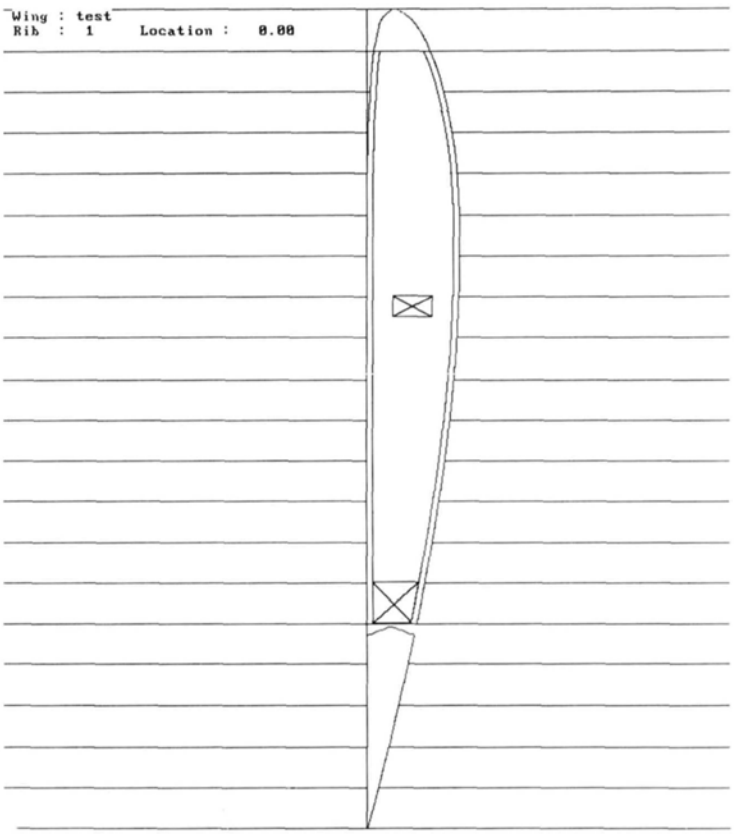
WE ARE TOLD that we are in the computer age, and that seems apparent even in the hobby. There are computer simulations which let us fly a model (or a full-scale airplane) on a computer screen. Now there are some programs being developed which will assist in the design work which goes into a model plan. Sort of a CAD (Computer-Aided Design) for model airplanes. One modeler who is working on developing a book which will detail a good deal of this material is Curtis Givens of Dayton, Ohio*.

The object of mentioning this is not to sell the book (which has not yet been published), but to encourage those of you who have developed programs which apply to model airplanes to send them to Curtis for inclusion in his book. (I have offered a couple of mine for his use and am pleased he intends to use them.) There is no money in Curtis' project for payment for the use of such material, but it will certainly be credited to the originator. If you have any programs you have written for use in the design or drawing of model plans, contact Curtis at the address at the end of this column.

I'd guess that most of us will live to see computers widely used in the design and construction of model airplanes. I have little doubt that the airplanes which result from such plans will prove to be better than many we have seen in the past. Here's your chance, you computer buffs, to have your work, and your name, immortalized.

If there's one thing that the builders of large airplanes have brought to the hobby, it's the non-competitive rally. IMAA* calls theirs a festival (and it is), and QSAA's in Las Vegas is a rally. There are some differences between the two events. IMAA does not presently permit the giving of trophies; QSAA does. IMAA permits non-scale models and QSAA does not. Other than that, the two events have a good deal in common.

They both provide an opportunity for like-minded individuals to get together, exchange ideas, and fly together without the pressure of competing for prizes or trophies. No scores are kept, no formal rounds are flown, and everyone seems to have a good time. (QSAA's trophy winners are chosen by the votes of those participating, not on the basis of airplane or pilot performance in formal events.)



Typical computer-generated wing-rib layout. Numerical x *and* y *plots insure accurate sections.*

There is obviously a great deal of appeal to such events as they are both well-attended, with IMAA's perhaps having a slight edge in numbers, although QSAA draws participants from many foreign countries. This appeal has been noted in other organizations as well. AMA held a one-day non-competitive such event at last year's Nats and there are rumors they will be sponsoring more of the same in the future.

IMAA hs grown dramatically in the past five or six years and now numbers over 5,000 members. Its Board of Directors is currently considering provision of one million dollars in liability insurance to each member and this may well be in place during the current calendar year.

IMAA also provides a quarterly publication which typically numbers over 100 pages. This journal (High Flight) contains articles and material written by knowledgeable large-model builders, reports of IMAA festivals and rallies around the country, and information of interest to the BIG builder. If you are such a builder and have not net joined IMAA, drop a note to the Secretary of

(Continued on page 103)

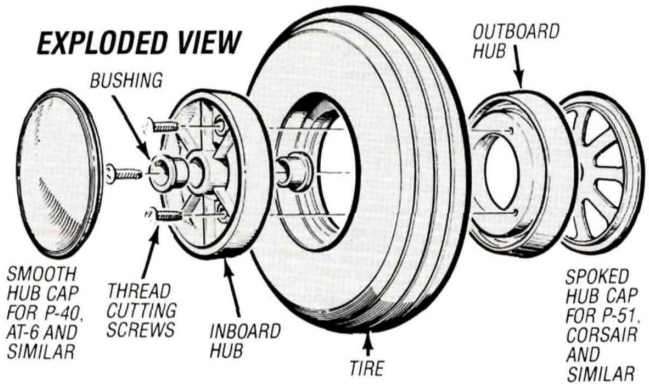
Scale Wheels & Tires

Now that you've accomplished what we told you in last month's M.A.N. about dressing up your landing gear struts, you're not really going to have those non-scale Piper Cub-type balloon tires on your P5-1, are you? 'Course not...you're on a roll and need some scale-looking, treaded tires with "proper" wheel hub detail. Checking around, we found that Robart manufactures two different tread patterns in a variety of diameters to fill the need of nearly every scale ship. Installing these wheels is uncomplicated but should be done carefully to insure proper, no-wobble tracking and drag-free take-off acceleration.

ROBART UNIVERSAL SCALE WHEELS

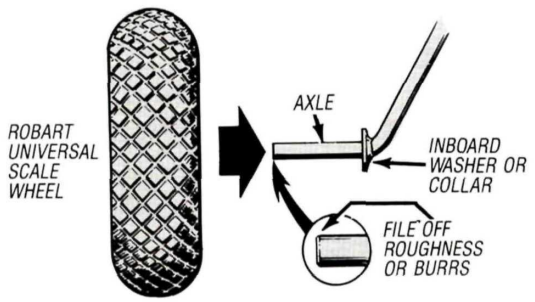
These unique wheels are available with two types of tire tread—smooth ribbed, as illustrated and the diamond tread as seen on some World War Two aircraft, most noticeably the Curtiss P-40 or the North American AT-6.

The high-speed LEXAN® wheel hubs snugly clamp the tire to retain pressure. Disassembly is not normally required unless there is a need to increase inflation pressure. (See INFLATION)



ASSEMBLY

Place inboard collar on the axle or solder a washer on the axle as desired. This collar or washer will prevent the wheel from trying to ride up the curve on the wire and thus causing drag on the wheel.

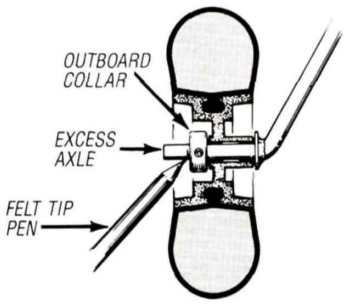


Check that there are no burrs or roughness on the wire. It is better to file a slight radius or bevel on the end of the axle. In addition, the axle should be free of blemishes such as vise jaw marks, and if any are found they should be carefully removed with a fine file and the wire polished with #600 emery paper.

Slide the wheel on the axle until it stops against the inboard collar. Slide the outboard collar into pace against the wheel and *lightly* tighten the set screw.

Check that the wheel spins freely, and if it does not, then move the collar outwards until a *barely perceptible* in-out movement of the wheel on the axle is detected. The wheel should now spin.

Use a fine felt-tip pen to mark the excess wire against the collar then remove the collar and wheel from the axle.



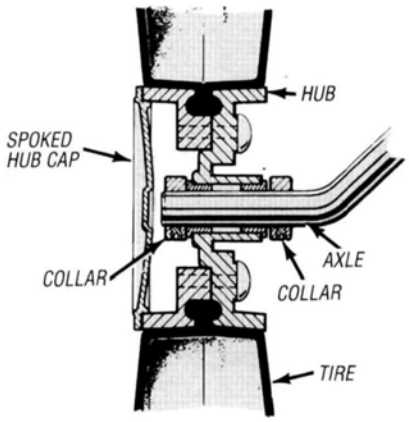
Grind off the excess axle wire then carefully remove the burrs.

Replace the wheel on the axle and again check for free-spinning before finally—and firmly—tightening the set screw on the collar.

HUB CAP OPTIONS

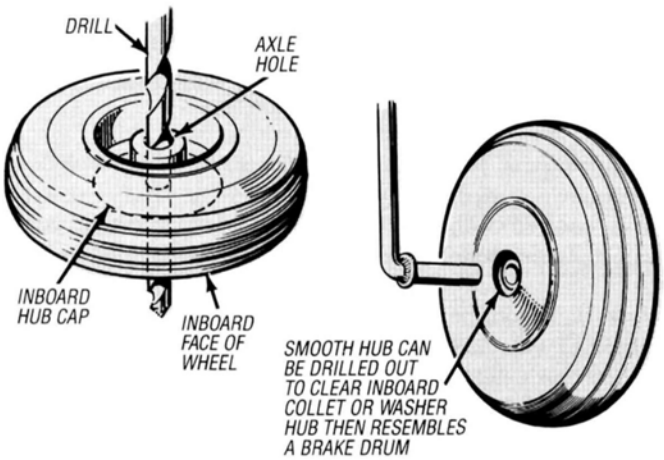
Spoked *and* smooth hub caps are supplied with your ROBART scale wheels and either hub cap may be fitted on the outboard side. However—the spoked hub cap is slightly "dished" and *might* interfere with the wheel collar on the

smaller sizes of wheel, and therefore the thickness of the collar must be reduced by grinding or filing. Alternatively, the wheel can be retained by soldering a washer to the axle. NOTE...before soldering the washer in place, put a paper washer as a shim between the wheel hub and the washer. This will provide proper clearance and also insulate the plastic wheel hub from the heat of soldering. In any case, soldering should be done as speedily as possible to prevent damage to the hub. The paper washer can be torn out with tweezers on completion.



Hub caps may also be fitted on the inboard face of the wheel, in particular the smooth hub cap which nicely simulates the brake drum. To achieve this, the wheel should be off the axle and the hub cap snapped into the inboard face of the wheel.

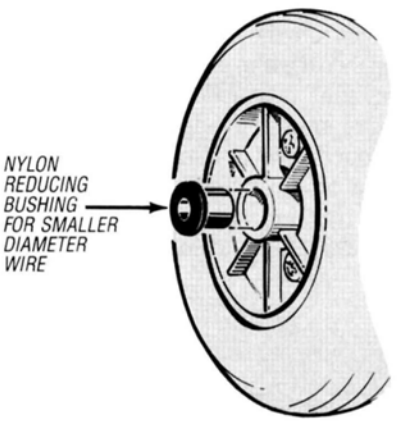
Use the axle hole as a drill guide to drill through the hub cap. Open out the hole to clear the inboard washer or collar.



Hub caps are a snap fit in place but a hard landing has been known to displace them. To avoid loss, apply a few spots of glue to the flange. Suitable glues are PACER PLASTI-ZAP® CA++, Testor's Plastic Model cement or RTV pipe cement as used by plumbers to join PVC pipes (available from the hardware store).

BUSHINGS

Molded nylon reducing bushings are provided with each pair of ROBART scale wheels. These bushings can be inserted into the wheel hub axle hole and will match the hub to fit 1/8, 5/32 and 3/16 diameter axles.



INFLATION

Increased inflation pressure can be achieved by cooling the loosely assembled wheel in the refrigerator, then tightening the hub screws before the tire warms to expand the trapped air in the tire.

A higher pressure yet can be obtained by placing ½-inch diameter chip of dry ice inside the tire then tightly reassembling the hub. As the dry ice warms, it gassifies and fills the tire with CO_2.

Yet another method is to disassemble the tire and place approximately 1/6 of an ALKA-SELTZER antacid tablet into one side of 10 to 15 drops of water in the opposite side. Carefully reassemble the wheel then shake vigorously. The tablet will effervesce inside the tire, generating a gas which will considerably increase the inflation pressure.

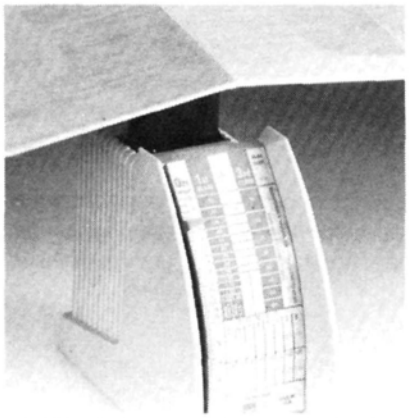
Also available from ROBART are special firm foam-rubber inserts which can be stuffed inside the tire before reassembling the hubs. See your dealer or call ROBART for price and direct shipping.

Small Steps

by RANDY RANDOLPH

THE CONTINUING discussion of weight reduction in our small aircraft must consider covering materials. By far, the most popular covering materials today are the plastic films, and Micafilm* is the lightest of them all. This material is heat shrinkable, light and very strong. By covering an average sized small airplane (300 square inch wing) with Micafilm you can save enough weight in the covering alone to add one more servo.

This light yet strong material does require a slightly more involved covering technique. Micafilm does not have an adhesive backing, the adhesive (Balsarite) must be brushed on the structure, allowed to dry, and then the film ironed in place. Where the film overlaps itself, additional adhesive must be applied before the film is ironed down. A number of modelers apply a coat of Balsarite to their aircraft before covering with any of the films so this is really not much of an inconvenience.



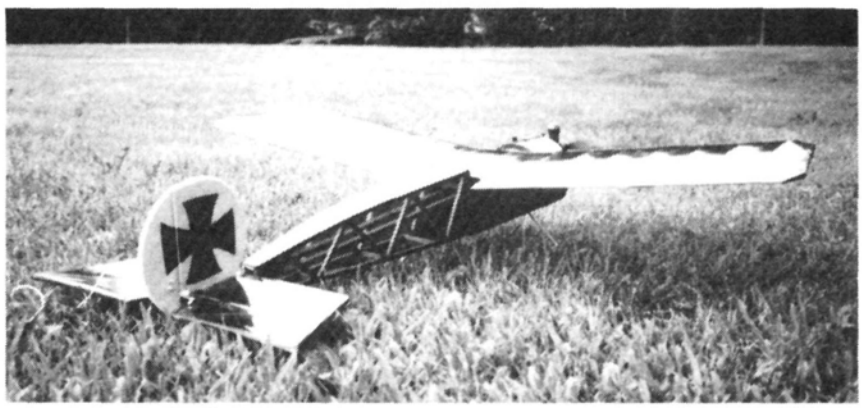
Building light pays off? See text for details.

When attaching the film to the structure use relatively low heat—230° or so. I use an old travel iron set to the Rayon temperature and it works fine. When too much heat is used the film will form small wrinkles that are difficult to remove from where they contact the framework. When shrinking the film do not let the iron touch the adhesive joints. The Balsarite will soften and the film will shrink away from the structure. Shrink with an iron—not a heat gun—the stuff will shrink beautifully and forgive a lot of covering errors.

Picture 1 shows a wing of 300 square inches built with a ¼ inch square leading edge and four 3/16 inch square spars. The trailing edge is built up from two strips of a 1/16 inch sheet. It is covered with Micafilm and the scale tells the truth (that's 1 ¾ ounces).

You remember Craig Hampson; he was the fellow whose letter to our editor was instrumental in getting this column under way. Well, that's him in picture 2 doing what he likes best.

Small airplanes can be hand-launched; quite an advantage at some fields. Craig Hampson does the honors.



A closer look at the airplane Craig is launching, a Champion Eindecker, Cox Black Widow power and Futaba radio. Looks as good on the ground as it does in the air.

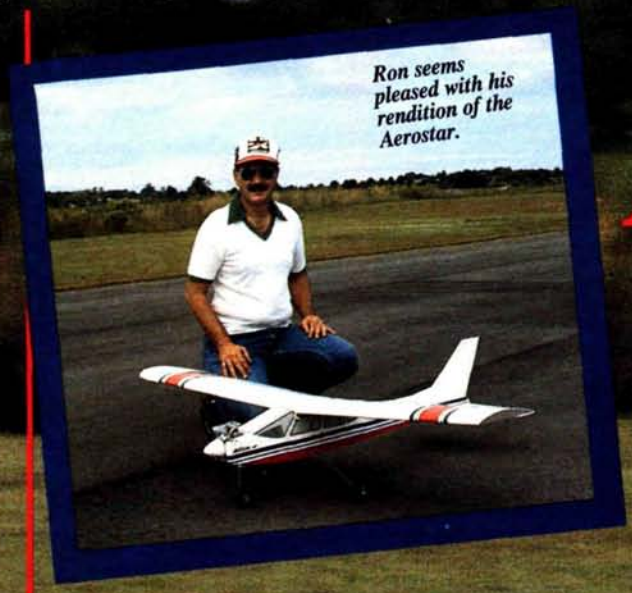
Picture 3 is a better look at Craig's airplane. He describes it: "...a Champion Fokker Eindecker, 36-inch span, Cox Black Widow power and Futaba micro controls, it comes to 17 ounces. Flights never exceed 300 feet and include wild gyrations, loops and rolls. This type of plane takes so little time to build that I am not scared to throw it around and thus have worry-free flying."

**The following are the addresses of the companies mentioned in this article:*

Micafilm is a product of Coverite, 420 Babylon Rd., Horsham, PA 19044. ■

MIDWEST AEROSTAR .40

by RON FARKAS



Ron seems pleased with his rendition of the Aerostar.

WHAT I LIKE MOST about the Midwest Aero-Star is that it is not only a good trainer, it is also really distinctive-looking. While its configuration and force arrangement must have come right out of a standard trainer-design specification, the rakish slope of the forward fuselage gives it a unique appearance. It also features a flashy color scheme and simulated window decals. The overall impression is that it could be the latest Cessna high-wing commuter airplane.

Despite its modern appearance, we find the traditional cabin-style fuselage with the wing located well above the thrust line. The fuselage dimensions are such that there is a long nose and tail moment which improves pitch stability. The horizontal stabilizer is mounted low where it benefits from being right in the wing downwash. Both the horizontal and vertical tail surfaces are adequately large for stabilization and control authority. The large constant-chord wing uses a thick high-lift flat-bottom airfoil for good, slow flight characteristics and a moderate amount of dihedral for self-righting ability. It is apparent

(Continued on page 28)

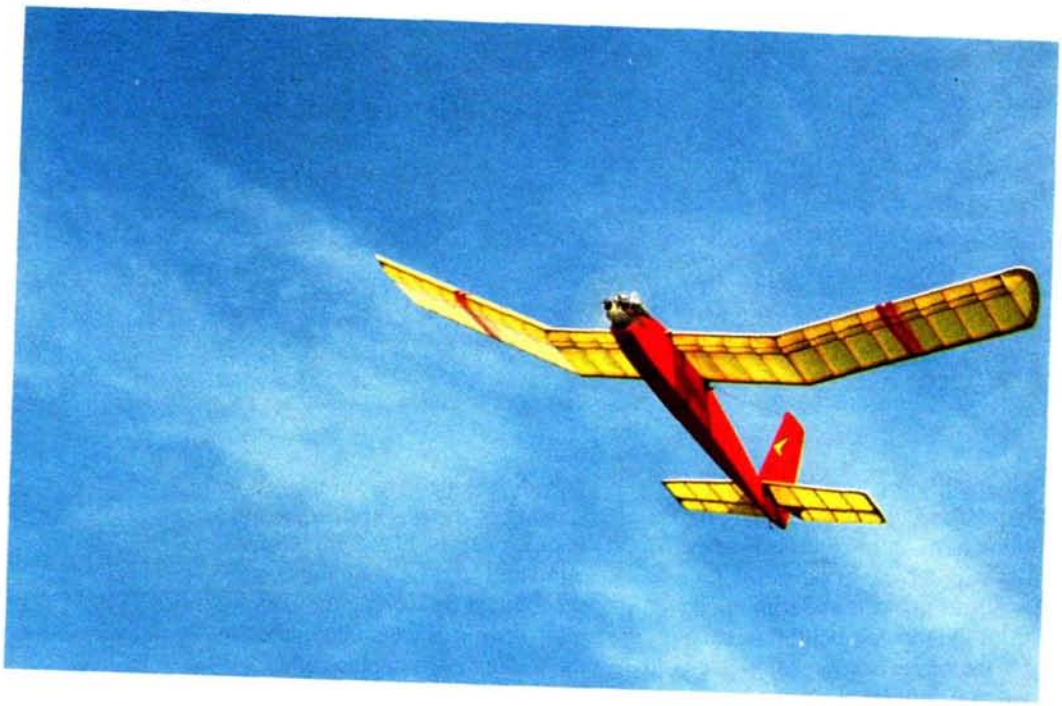
A nifty entry-level airplane with a refreshing "non-trainer" appearance...

Midwest Aerostar 40

Type: *Trainer*
Power: *.40-.45*
Span: *62"*
Wing Loading: *15-17 oz./ft.²*
Weight: *Avg. 5 lbs. (80 oz.)*
Channels Req'd.: *3 minimum*
Suggested Retail Price: *$84.95*
Features: *Micro-lite ply and balsa conventional construction. Designed for newcomer to R/C. Consruction manual is excellent and well illustrated.*

.10-.15 power, lightweight, simple construction...relaxing flyer.

Construction



Twilighter II

by RANDY RANDOLPH

THE TWILITER that appeared in *Model Airplane News* March '87 has proven to be rather popular with the "fly-after-work" bunch and as a foolproof trainer for a wife or girl friend. So far only two complaints have been registered: the engine run is not long enough with the Cox built-in tank and there is no provision for a throttle.

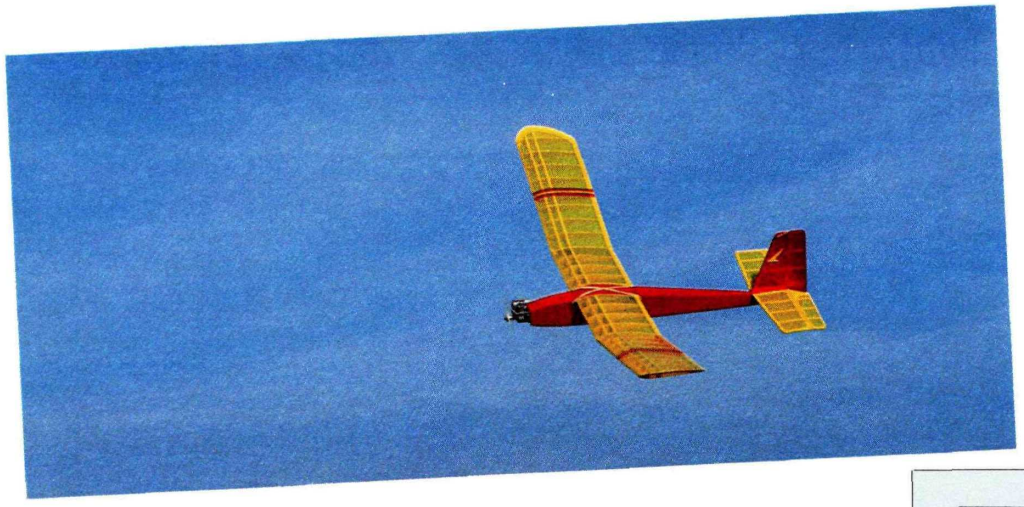
Although throttles are available for Cox engines (and they do work nicely), they just don't provide the wide range of power which is available with a slightly larger engine of more conventional design. The engine situation can be improved with the addition of a larger internal tank, but installation can be a problem and location is rather critical for good engine performance with the reed valve engines. Of course, a TD can be installed with a separate tank to provide a longer engine run, but the throttle problem still remains. The best answer seems to be a larger airplane with a larger engine. Enter the Twiliter II!

This is not exactly a scaled-up version of the .049 airplane because some changes have been made to broaden its performance envelope. It will fly slower than its counterpart and at the same time be trimmed to penetrate the wind under breezy conditions. Control response remains about the same as the smaller version, but with a more solid feel—similar to aileron action.

With factory mufflers, the .10 to .15 size engines are quiet when they are run at reduced throttle, and will fly a very long time on a 4 oz. tank. The throttle response is beautiful, allowing a very wide range of power settings. The availability of muffler pressure to the tank helps keep the needle setting constant and throttle response predictable throughout each flight. Besides, it's bigger and easier to see in the evening sky!

CONSTRUCTION As a rule, wings require the most construction, so it's a good place to start.

The ribs are cut from 1/16-inch sheet of balsa. They can be cut from a printed sheet made by tracing around a card stock template with a fiber tipped pen, or they can be cut



all at the same time by stacking balsa blanks together, tracing the rib pattern on top and sawing them out with a band or jig saw.

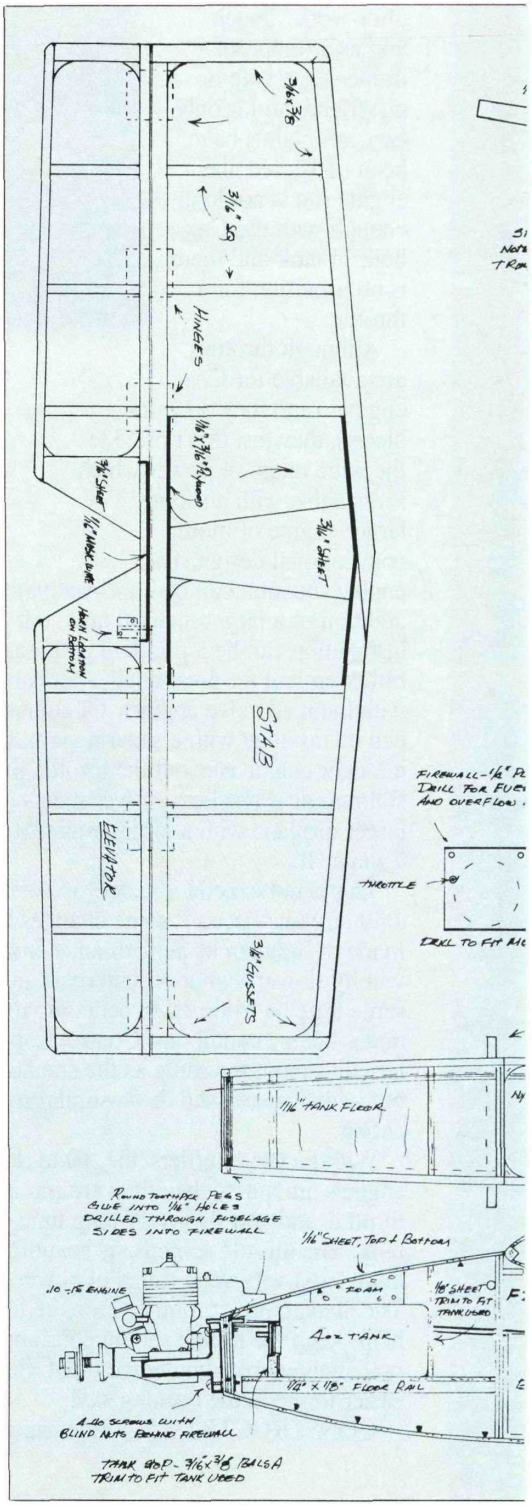
Select two ribs and trim 1/16-inch from the top and bottom of each for the center section and while you are at it, enlarge the main spar notches by four to accept the dihedral braces. Cut the webs from 1/16-inch sheet. Notice the grain? Spars can be purchased, but the preference is to strip them from the appropriate sheet wood with a balsa stripper. If you don't have one, it would be well worth your time to get one. The choice of wood depends on the intended use. The spars should be straight-grained, medium balsa. The leading edge can be of slightly softer wood if desired so it can be sanded more easily to shape. The trailing edge sheet is the same as the spar stock. Slice the tip pieces from soft 1/8-inch sheet; notice the grain in each piece.

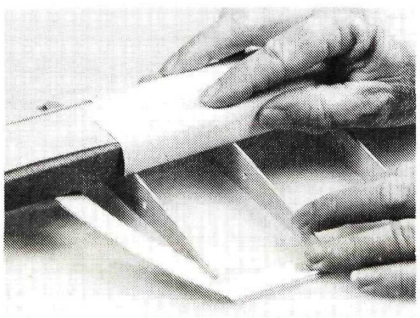
The wing is built in three sections: the center and the two tips. They are all the same size; the only difference between them is the slanting of the ribs at the dihedral joint. Cover the plan with plastic wrap and start building the center section first by pinning the bottom main spar in place on the plan. Pin the trailing edge in place and starting with the two trimmed center ribs, proceed to glue ribs and webs into position. When installing the two end ribs (wide notches), use the template to trim the webs to the proper angle so the ribs will be slanted for the dihedral.

When all the ribs and webs are installed, add the top spars. Be sure the main spar is glued to the webs as well as the ribs. Do not add the top trailing edge sheet just yet; it will be installed after the wings are joined at the dihedral joints.

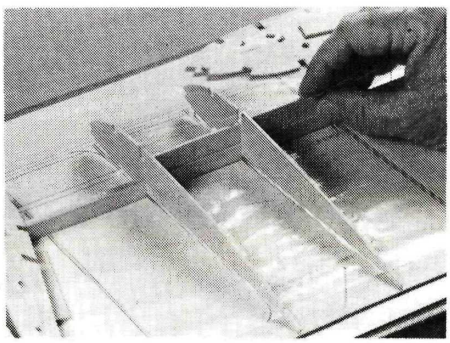
Build the other two panels in the same way with the angled ribs in the proper places. When all three sections are completed, trim all spars and trailing edges flush with the slanted ribs and join the three sections with 1/16-inch plywood dihedral braces. Place the center

(Continued on page 100)

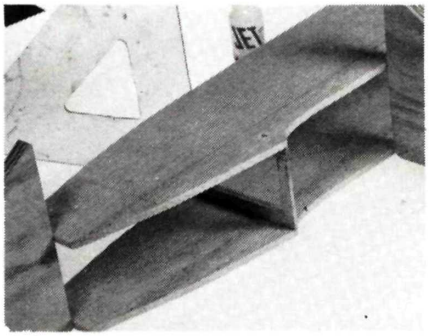




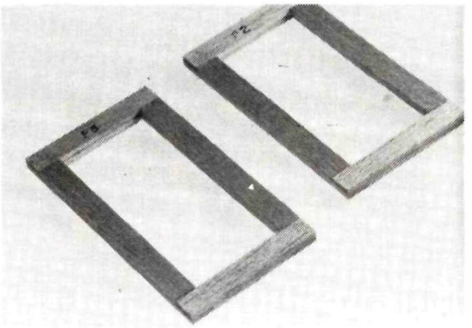
The wing tips are sanded flush with the top of the wing. Paper wrapped around part of a sanding block makes it possible to shape the tip without sanding the top of the wing.



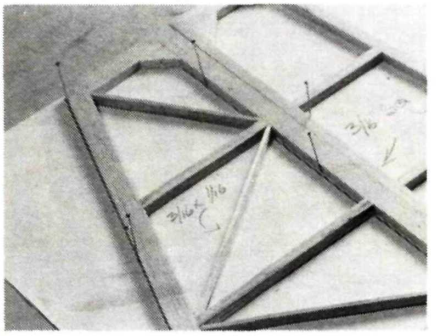
The wing is built in the time-honored way, right over wax paper, or plastic wrap, covered plans. Webbs in the center section add much strength and little weight.



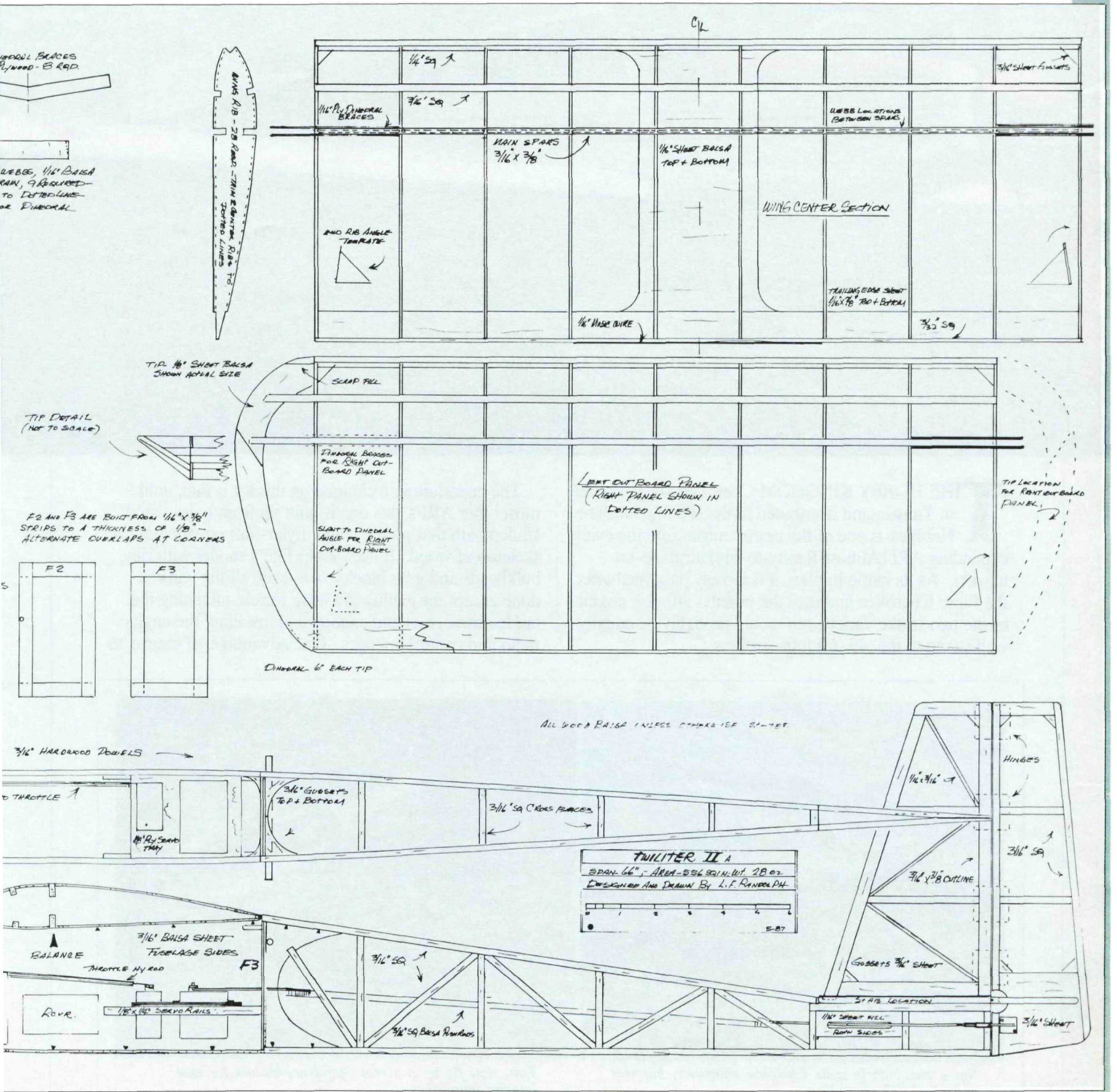
Right triangles are quite handy for fuselage assembly; line everything up and hit it with the Super glue.



The cabin formers are built up from strips of balsa; makes strong and light bulkheads. They can be cut from 1/8-inch ply, but the savings in weight is worth the effort to build them from balsa.



When building the tail surfaces and fuselage sides try to hold things in place with pins on the outside of structural members rather than through them.



Field & Bench Review

SUNSHINE HOBBIES

CHEROKEE 40

A "NEW" TWIST IN ARFs. THIS ONE'S MADE FROM BALSA!

by RICH URAVITCH

THE HOBBY KINGDOM Cherokee 40, produced in Taiwan and distributed in the U.S. by Sunshine Hobbies, is one of the newer entries into the ever-expanding ARF(Almost-Ready-to-Fly) airplane-kit market. As its name implies, it is loosely patterned after the Piper Cherokee and uses the popular .40-size engine of the two stroke variety, but would probably be equally well suited to the .45-.60 four-strokers.

The departure in technique on this kit is that, unlike most other ARFs, this one is built up from balsa wood. Underneath that pretty, white mylar-film covering lies a skeleton of wood. It even looks like a model with ribs, bulkheads and gear blocks. Anyway, all the work is done except for joining the wing panels, attaching the tail feathers, cowl and canopy and installing the engine, radio and control linkages. One advantage, of course, to

Not a particularly scale Cherokee maneuver, but still performed with no problem.

Low, slow fly by is a real confidence-builder for spot landing approaches.

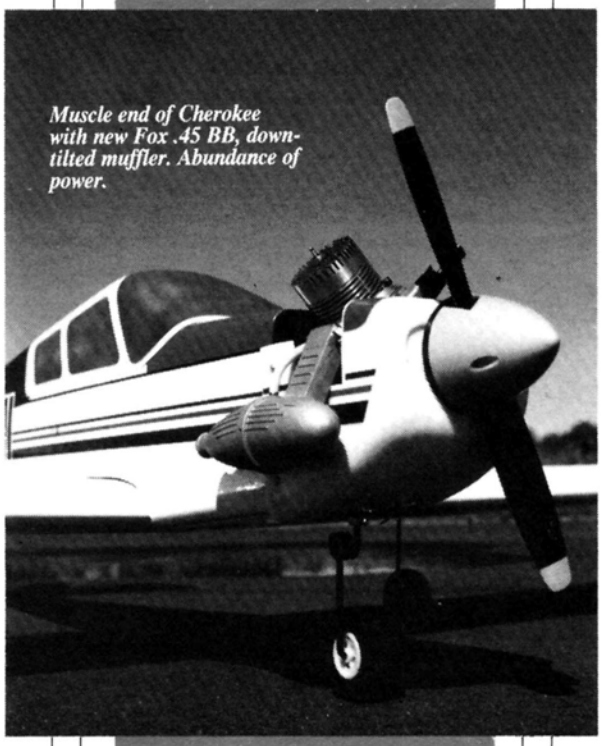
the balsa construction is that repairs are easily accomplished using conventional materials and techniques.

The construction manual is only partially helpful. It contains enough sketches and words to guide you along, but some of them can be misleading. You may get the impression that the instructions were from another kit, especially when they talk about the wing "foam skin" or the center section "covers." They don't exist, so don't bother looking for them. To offset the time you might have spent hunting for these parts, Hobby Kingdom has thoughtfully performed the installation of the ply-wing plate. (But they tell you how to do it anyway.) Some helpful bits of information are unfortunately omitted. One is that the control system throws. I use 3/16-inch in each direction for the ailerons and 1/4-inch for the rudder, elevator and the CG. I balanced my Cherokee right on the wing spar, which is a bit nose-heavy and will pretty much preclude any spin maneuvers but, radually moving it aft to your liking should allow you to achieve the flying qualities you prefer.

The kit is very complete and contains all the required accessories including linkages, hardware, fuel tank, spinner, wheels and a decorative mylar trim sheet. About the only things you'll need to add are your choice of engine, prop and radio.

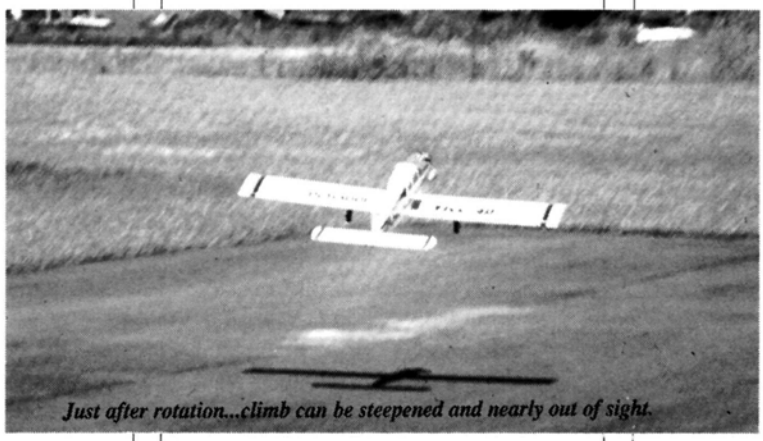
Assembly time is about two evenings, depending largely on how quickly you install radios. There's plenty of room for installation, regardless of which of the current-day systems you choose. Here's a little hint that I used on the Cherokee, but has application to nearly every model that uses bolts to attach the wing. Ever notice how difficult it is to accurately drill through the wing into the hold down blocks? Try drilling the hold down blocks first, and then install the screws you intend to use to hold the wing on. Screw them in until the heads are just penetrating into the wing saddle area, then position the wing, pressing it firmly against the protruding screw heads.

Type: *Sport-Intermediate, ARF*
Power: *.35-.40*
Span: *55"*
Wing Loading: *18-20 oz./ft.²*
Weight: *Avg. 4¾ lbs. (76 oz.)*
Channels Req'd.: *4*



Muscle end of Cherokee with new Fox .45 BB, down-tilted muffler. Abundance of power.

Suggested Retail Price: *$203.99*
Features: *Pre-built and covered, conventional balsa structure. Requires engine, radio and adhseives.*



Just after rotation...climb can be steepened and nearly out of sight.

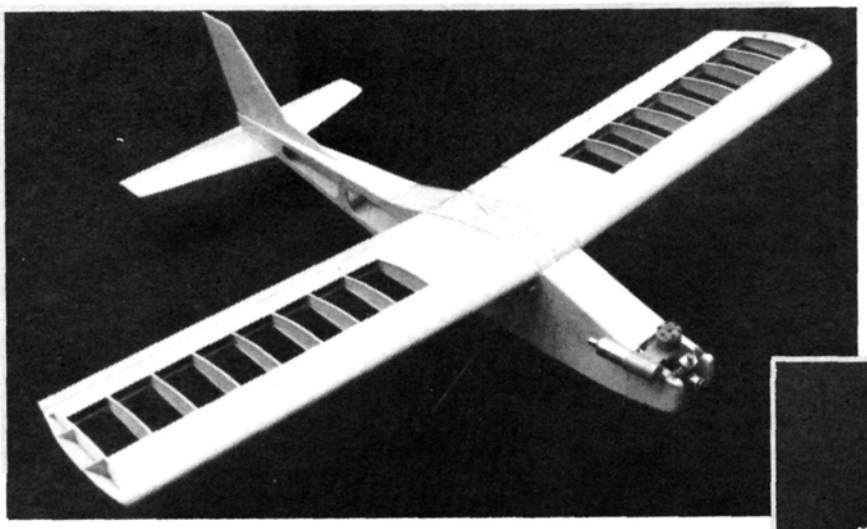
The impression they leave in the wing's surface will indicate the exact drilling point.

The only problem I found with the airplane is the main-gear mounting. Following common practice, hardwood blocks are positioned between two wing ribs. Unfortunately, these ribs are balsa and, in the case of my kit, soft balsa. After a number of aggressive arrivals, the R.H. side broke. Interestingly enough, the only visible, external indication was the tearing of the lower film covering. After cutting away sufficient mylar to assess the damage, it was obvious what had happened. The ribs just couldn't handle the imposed side load. The fix is simple. Just make some 1/16-inch ply or 1/8-inch hard balsa duplicate ribs to use as doublers on the existing ribs which hold the gear blocks.

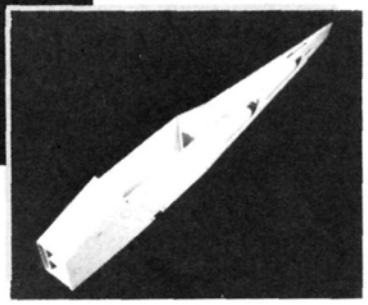
After better than twenty flights on the Cherokee since the fix, the problem hasn't resurfaced.

The engine I used in the Cherokee was the new Fox .45BB Deluxe. It is incredibly powerful and very tractable. My experience with Fox engines goes back, like a lot of us, to times when I was on the handle end of a Top Flite Nobler or Veco Thunderbird being moved briskly around, up and over the circle by a Fox .35. Duke's engines have changed quite a bit and their R/C versions offer the modeler real value. I avoided using the earlier .40 and .45 versions because the only way I could get them to work reliably was with someone else's carburetor. Well, this new Fox has got a redesigned carb that works well and is easy to adjust. In all fairness, however, the .45 installed in the Cherokee is a bit rough running. I tried everything to smooth it out, but

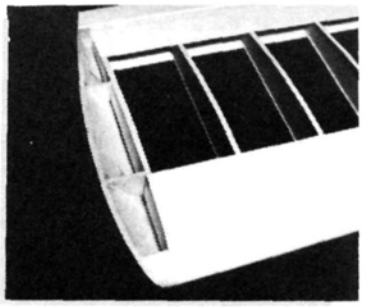
(Continued on page 50)



Completed airframe before covering.

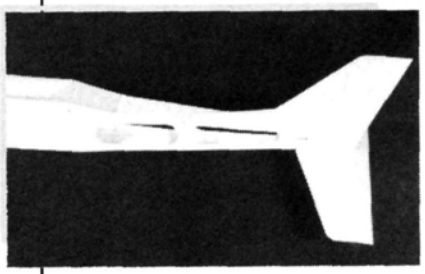


Nearly completed fuselage, showing the fit of the die-cut light plywood parts.



Close-up of right wing tip showing its built-up construction.

New Webra Sport .40 was remarkably docile for a brand-new, out-of-the-box engine. Excellent idle.



Fuselage aft section showing installation of tail components.

that the Aero Star was designed by someone who knows what factors make an airplane a good trainer.

The wing assembly consists of the time-honored rib-and-spar construction with leading edge sheeting, spar webbing and full capstrips. The structure is often referred to as a D-tube because a cross section of the wing looks like the letter D. The tail surfaces are simply built from balsa sheet parts. For the fuselage, Midwest chose the modern technique of using die-cut interlocking light plywood parts that go together in a jiffy and produce a very rigid box structure. The ease of construction is further enhanced by the excellent instruction manual of one hundred pages or so which includes hundreds of clear illustrations.

The Aero-Star comes in two sizes—for engines in either the .40 or the .20 class. The .40 size, as reviewed here, has a 62-inch wingspan with 675 square inches of area and a weight in the 5 to 5½-pound range. Specific engine recommendations are from .30 to .40 cubic inches for two-stroke engines or .40 to .45 for four-strokers. For comparison, the .20 size Aero-Star has a 52½-inch wingspan.

Midwest has approached the issue of using three or four channels by giving the builder the option. The instructions and the plans show wing construction either with or without ailerons and all of the required materials are included for aileron operation. However, both versions call for the same amount of dihedral—which is rather moderate—leading this reviewer to believe that the designer favors the use of ailerons.

It looks like Midwest has made a big investment in the Aero-Star trainer and by doing so has provided the R/C beginner with the best possible model to start with. The design is well thought out, the kit is well engineered, and the material quality and parts fit are excellent. The plans, instructions and

(Continued on page 91)

P-47 THUNDERBOLT
KIT / PLAN GUIDE
A BUNCH OF JUGS, TAKE YOUR CHOICE

Given that the Republic P-47 Thunderbolt is way up on the list of popular military modeling subjects and that the theme of this issue is the "Jug," we felt that you'd come away inspired enough to jump right into a T-bolt project of your own. To that end, we've compiled kind of a modelers' guide which captures all the P-47 kits we're aware of. After reviewing the list, we discovered that it covers every size of P-47 from ½A right on up to just short of ¼-scale!! So guys, there's no longer an excuse... Winter's here, let's get to it!!

Type: Sport/Sport Scale
Span: 36"
Power: ½A
Weight: 22-28 oz.
Channels req'd.: 2-3
Suggested Retail Price: approx $39.95
Features: *All balsa construction, formed plastic fuselage top and canopy, illustrated instructions and decals.*

HOUSE OF BALSA

Type: Small Sport Scale
Span: 40"
Power: .15-.19 two cycle
Weight: 2-2½ lbs.
Channels req'd.: 3 minimum
Suggested Retail Price: $10 (plans only)
Features: *Full-size construction plans, (#6843) featured in June 1984 MAN. Molded canopy and cowl available.*

MODEL AIRPLANE NEWS

DAVEY SYSTEMS CORP. *(formerly Champion Model Aeroplane Co.)*

Type: Sport Scale
Span: 52"
Power: .40-.60 2-cycle, .90 4-cycle
Weight: 5-6 lbs.
Channels req'd.: 4 minimum
Suggested Retail Price: $95.95
Features: *All wood kit with full-size rolled plans and molded canopy.*

DYNAFLITE *(formerly Mark's Models)*

Type: Sport/Precision Scale
Span: 54"
Power: .60 2-cycle
Weight: 6-8 lbs.
Channels req'd.: 4 minimum
Suggested Retail Price: $134.95
Features: *Balsa fuselage and tail group, form wing cores. Molded cowl, drop tank, bombs, and clear canopy. Decals availabel for six different point schemes.*

Type: Sport/Precision Scale
Span: 61"
Power: .60 2-cycle
Weight: 8-10 lbs.
Channels req'd.: 4 minimum
Suggested Retail Price: $39.95* plus shipping
Features: *"PLAN PAC" includes plan, fiberglass cowl and canopy (bubble). Pre-cut ribs available for $15. Limited availability on FULL kit.*

BOB HOLMAN PLANS

Type: Sport Scale
Span: 60"
Power: .50-.60 2-cycle, .90 4-cycle
Weight: 7-9 lbs.
Channels req'd.: 4 minimum
Suggested Retail Price: $146.95
Features: *All balsa with molded cowl and canopy. Full-size plans plus construction manual.*

TOP FLITE MODELS, INC.

Type: Sport/Precision Scale
Span: 80", 1/6 scale
Power: St. 2500-3000 or larger
Weight: 20-23 lbs. with retracts
Channels req'd.: 4 minimum
Suggested Retail Price: $235 plus shipping
Features: *Fiberglass fuselage, cowl and belly pan. Pre-sheeted foam cores for wing and empennage. Formers pre-installed and all wood parts pre-cut. Available in bubble-top or razorback version.*

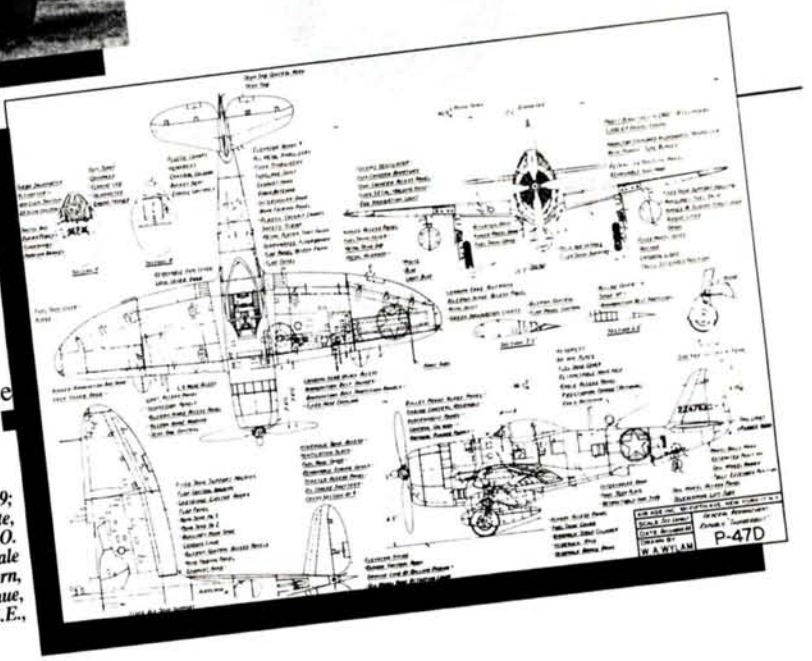
SCALE FLIGHT MODELS

Type: Sport Scale
Span: 80"
Power: Quadra 50-Sachs
Weight: 22-24 lbs
Channels req'd.: 6 with retracts
Suggested Retail Price: $536
Features: *Fiberglass fuselage and cowl, molded canopy (razorback version), with molded foam wings and tail group. Custom retracts available along with scale four-bladed prop drive system.*

BYRON ORIGINALS, INC.

Type: Giant Scale (2.3": 1 ft.)
Span: 92"
Power: 2.4-3.7 cu. in.
Weight: 26-32 lbs.
Channels req'd.: 4 minimum
Suggested Retail Price: $240 plus shipping
Features: *Semi-kit includes fiberglass fuselage, cowl and clear canopy plus plans showing all ribs and formers.*

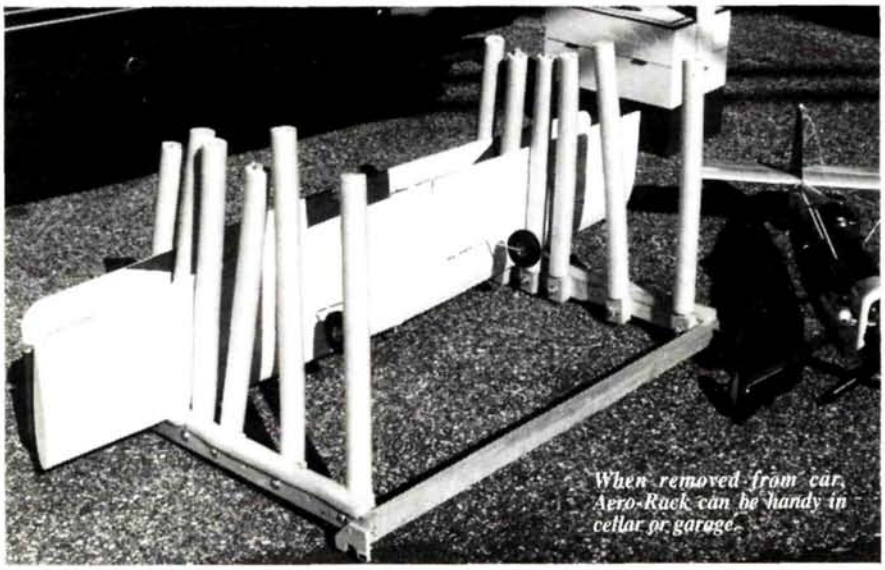
VAILLY AVIATION



A two sheet set of **the P-47 W.A. Wylam drawings,** partly reproduced here, are available from *Model Airplane News.* Send $5 plus $1.50 postage and handling to Air Age mail order service, 632 Danbury Road, Wilton, CT 06897.

These are not construction plans but highly detailed drawings which show fuselage sections, airfoils and surface detail. Ideal for documentation purposes.

SOURCES REFERENCED IN THIS GUIDE:
Bob Holman Plans, P.O. Box 741, San Bernadino, CA 92402, (714)885-3959; House of Balsa, 20134 State Road, Cerritos, CA 90701, (213)860-1276; Dynaflite, P.O. Box 1011, San Marcos, CA 92069 (619)744-9605; Byron Originals Inc., P.O. Box 279, Ida Grove, IA 51445, (712)364-3165; Vailly Aviation, 18 Oakdale Avenue, Farmingville, NY 11738; Davey Systems Corp., 1 Wood Lane, Malvern, PA 19355, (215)644-6772; Top Flite Models Inc., 2635 S. Wabash Avenue, Chicago, IL 60616, (312)343-0955; Scale Flight Models, 11023 38th Dr. S.E., Everett, WA 98204 (206)337-0868.



When removed from car, Aero-Rack can be handy in cellar or garage.

CAR / VAN

by REED KALISHER

Aero-Rack

Airplanes and necessary support equipment are kept safely organized in the author's Plymouth Voyager.

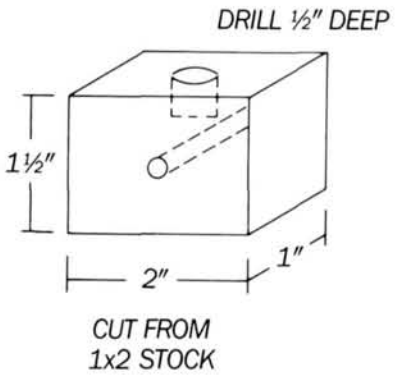
SOME IDIOT cuts me off on the way to the field and as I hit the brakes, I can hear the wings, fuselages, and flight kit tumbling around in the trunk. The damage is only slight, but hangar rash (and transport damage) is all too common in this hobby. I decided to do something about it, and to that end, I designed and built a transport and storage rack that really works.

Before I go into detail, I want to point out that I am not selling or reviewing a kit, and there are no "full-size plans" available. This is because this system is largely based on personal requirements. In other words, take your basic system, add a little imagination, and create the perfect rack for your cars and planes.

I designed this rack to carry a minimum of planes to the field. Actually, depending upon how you design the rack, it can carry more. The configuration pictured is for hauling three wings and two fuselages.

When you design yours, it is important to decide what you want to carry, and in what vehicle. I use a Plymouth Voyager to haul my gear. Any of the mini-vans are great for this hobby. If you have a station wagon, then you might not want to suspend the rack as I did, but rather set it on the rear deck. If you drive a sedan, then a "mini-rack" might fit into your trunk. All these things should be considered when designing the ultimate rack system.

Let me describe mine for you so you'll get the idea.

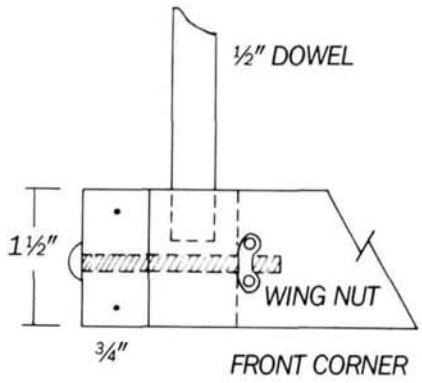


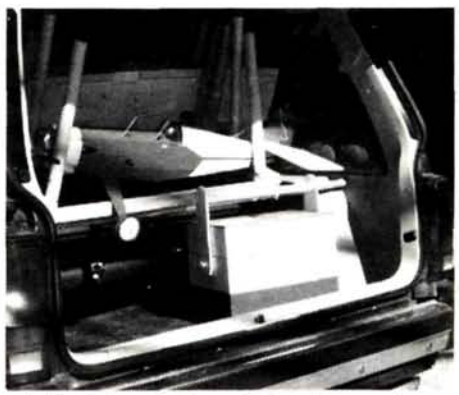
The width of my van at the rear side windows, is 62 inches. Most of my planes are of the .40 size, with spans under 60 inches. This means I have room to carry the wings width-wise. If I need more space I can turn the rack to carry the wings running front to rear. None of my wings have a chord over 12 inches, but I over-designed to 18 inches deep (for future). The clearance still allows me to suspend the rack by folding the third seat (much simpler than removing it). This also leaves me the rear floor space for extra storage.

To suspend in the simplest way, I purchased an adjustable closet rack. Since it is spring loaded, I simply expanded it and installed it under pressure. I put plywood key-slots on the rear side to keep the rack in place. (I recently added rubber bands to keep the key from jumping out on bumpy roads.)

For the front, I attached some eyehooks to either side so as to accept one end of a pair of bungee straps. The other end goes to the clothes hanger clips. This provided sufficient shock absorption and simple installation.

By the way, I can also hang the carrier on the wall, place the rods at positive angles and use it as a storage rack.





Author's Aero-Rack was designed to carry three wings and two fuselages. Yours can be custom-designed to carry more or less.

BUILDING. The first thing to do after sketching out your rack is to purchase correct materials. I built my frame out of

(Continued on page 101)

Tech Tips

Sporty Scale Techn

by RICH URAVITCH

"COCKPIT"

Most scale subjects like the F-86 benefit from the inclusion of a realistic pilot figure.

WE'VE ALL SEEN a good number of well-executed sport scale models with all of the riveting, panel lines, and weathered finishes done in a very convincing manner while the cockpit area was left untouched or consisted of a bug-eyed, stone-featured pilot bust staring straight ahead as if mesmerized by the spinning prop in front of him. The very requirement for inclusion of a pilot at all has, in the past, been controversial. How a builder can spend endless hours producing a high quality model and leave a vacuum under the canopy or behind the windscreen totally escapes understanding. Do yourself a favor; spend some time on the cockpit area. The sight of a good looking model doing a fly-by with the pilot looking back at you is well worth the time.

The cockpit shown in the buildup sequence of photographs is one I prepared for my ducted fan F-86. Built from balsa, plastic, and card stock, it's pretty typical of minimum time expenditure and provides an extra bit of realism. Since exact scale was not a requirement, various photos of the F-86 were used and a close approximation was fabricated. The instrument panel consists of a number of commercially available faces mounted on a painted card-stock backing. This is not a complicated procedure, and in conjunction with the reworked pilot, provides the "front office" with a realistic, final touch to the model. The documentation you'll collect on the airplane will probably contain a number of views of the cockpit, making it just a matter of interpreting what you see and using a little bit of ingenuity for duplication.

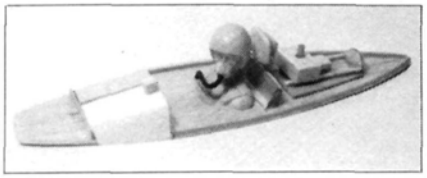
I generally use a Williams Brothers' pilot figure selected by scale size and type of aircraft. They are nicely done, and with a little bit of customizing can add a sense of animation to the cockpit. Some of these busts are now available with the

Williams Brothers pilot uses micro-balloons and scrap plastic to create baseball cap and headset.

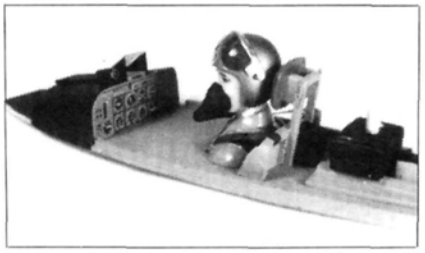
head molded separately to allow repositioning. If the size or style you require isn't available, the following procedure will guide you through making your own.

In order to eliminate the "rigor mortis" appearance of the stock pilot, surgery in the form of decapitation is per-

iques



F-86 Sabre cockpit prior to painting and detailing.



Same cockpit after painting. Note oxygen mask and reflector sight.

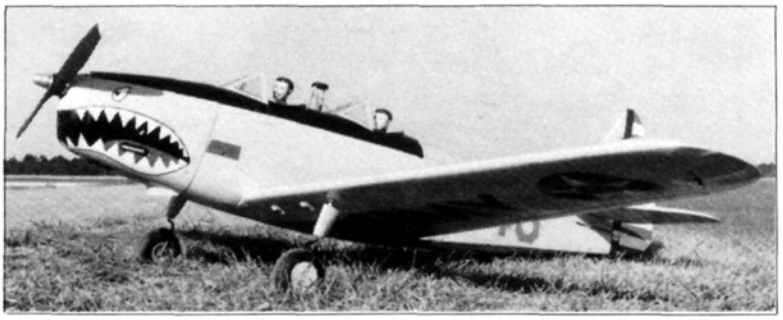
formed. The first incision is made just below the base of the skull at the shirt or jacket collar line and carried around the neck until the head separates from the torso. A small amount of trimming will allow the head to be tilted to the desired position. Once the test fit is accomplished, a small balsa joiner plug is made up and the head zapped onto the torso. Any gaps around the neck should be filled with a resin/micro balloon mix or plastic model filling material such as Squadron "Green Putty." Now that you've got a basic pilot, you can add little details such as a baseball cap or oxygen mask, depending on your requirements. The mask on my F-86 driver was made with micro balloons and a short length of small fuel line to represent the hose assembly.

At this point, the pilot bust should be wiped down thoroughly with alcohol or another cleaning agent to eliminate any surface films which may prevent proper adhesion of paints.

Depending on the depth of the cockpit "floor" below the fuselage sides, you may have to provide some height for your pilot. This is easily accomplished by adding an oversize block of balsa to the bottom of the bust, carving and sanding to match the plastic and filling the seam. I generally brush on a couple of quick coats of resin to fill the balsa grain. It's not necessary to get a glass smooth finish since the area you're creating is generally that of the pilot's clothing.

Painting and detailing may be as simple or elaborate as you like with color selection based on whether you're making a civilian or military pilot. In either case, care should be taken in the area of the eyes since you don't want to create a bulged effect. Although I'm not an artist, I've gotten acceptable results by painting the entire eyeball white first and then filling in most of the area with the color desired. Leave only a spot of white in each corner of each eyeball. This should complete the pilot.

The completed pilot may not be installed in the cockpit. The method I usually use involves drilling a series of small (⅛-inch) holes in the bottom of the pilot figure and a similar set of holes in the cockpit base immediately below the pilot. A layer of silicon bathtub seal is applied to the cockpit floor and the pilot figure pressed firmly into position. This allows the excess adhesive to squeeze into the pre-drilled holes in both surfaces. This forms flexible rivets which will prevent the pilot from breaking loose through normal vibration. ■



Hobby Shack PT-19 with a pair of Williams pilots. Different head angles enhance realism.

Pattern Matters

by MIKE LEE

Tech Talk

The project engineers and pilot. From left, class instructor Phil Faraci, student Joe Mares, Mike Lee, Kevin Colwell, Chris Willert and assistant instructor An Hua. The plane weighed in at 13 pounds dry, twin O.S. Max .45 FSR ABC engines, about 950 squares.

WE EXPERIENCED an exciting adventure in aeromodeling last spring while assisting some college students in the field of engineering. I realize that this isn't really pattern, per se, but aeromodeling is aeromodeling, and I wanted to pass on this experience.

It all started just before the Christmas season when I was approached by Kevin Colwell about an aircraft design he was contemplating for use in an engineering project. The mission was to design the aircraft with features which would prove several engineering theories. As it was, it was required that it be twin engine powered, have a flight envelope to allow slow-speed flight of 20 mph and high-speed flight exceeding 60 mph, and carry an onboard camera for aerial photography. On top of this, Kevin, assisted by several other students, would have to prove the reasons for his choice of airfoil, the configuration of the engine layout, the reason for the use of flaps, as well as his weight and dimensional goals. Quite a year-end thesis.

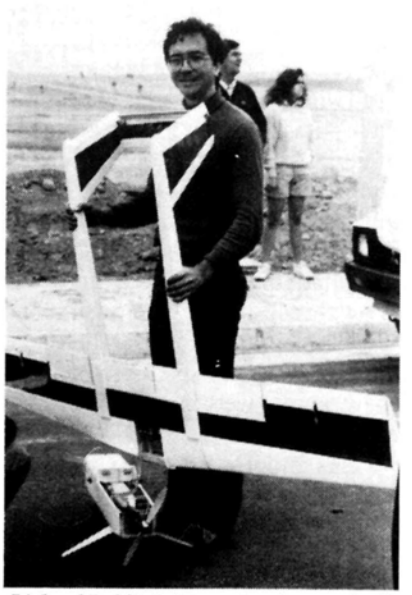
After several quick and dirty sessions of question and answer, Kevin and company finally constructed their ship and had it ready for flight. Kevin asked yours truly to perform the initial airframe check-out to see if the ship was airworthy. Now that was an honor! I ended up on the campus of the University of California at San Diego with about two dozen students and the instructors mulling over the bird. Overall, the bird looked pretty sound. A bit of wash-in here and wash-out there, plus a stab slightly out of alignment, but sound for flight. Then they asked me to taxi the bird...

Author Mike Lee received some kidding while looking over the newly developed aircraft. The engineer project culminated over six months of research.

Well, as you can see from the pictures, we were standing in a parking lot around the bird after a very successful taxi test. Whew! Got through that one, and we even lifted the nose from the pavement. Well, that was that. Not quite! Kevin then popped the big one on me..."Will ya fly it for us?"

Now I was really honored. I got to have my dirty little paws on this one and fly it. I proceeded to set up a time and date, and off I went until then. Boy, what an opportunity.

On the appointed day of flight, I showed up at the field and proceeded to warm up my fingers on the Checkmate. So far, so good. And just like clockwork, the students, a whole caravan of them, came rumbling down the road. Not only did they bring out the new bird, but also



Richard Bakhit holds up the wings and tail booms for assembly. Note the very wide flaps at the wing trailing edges. Allowed extremely slow flight.

4 wheel ATV that another part of the class had constructed for test on this date.

The basic configuration of the bird was a push/pull engine set up on the fuselage, using twin O.S. Max 45 FSR-ABC motors. The tail set was a twin boom with top stab and elevator. Huge flaps inboard and outboard of the tail

booms were present, with about 75 degrees of deflection. A flat bottom airfoil was used to gain maximum lift of this 13 pound bird. By the way, this bird was also designed to stay aloft for up to an hour, so they used twin 24 ounce tanks. And here's the kicker to the plot...if the bird didn't fly, the students didn't pass! Holy cow, these graduates' hopes rested on some little oriental guy from Tucson.

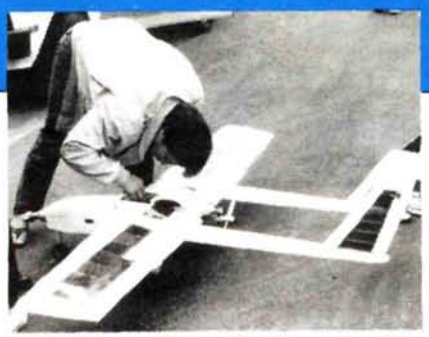
With the pressure on, Kevin decided to add even more spice by informing me that he had called on the local media to cover the event. I thought he was kidding until some guy who looked and acted like a cop showed up with a tele-cam. Great, now all I had to do was splatter this bird in front of God and the world. With a complete check-out performed, the O.S. Max engines fired perfectly and we began the long taxi to the end of the runway.

Geez, guys, these engineering students know their stuff. This bird took to the air just like a sport trainer with solid control. No sweat as the bird lifted, with the slight exception of the wing flexing under stress. Hmmm, could be a rather weak wing, so no funny stuff. Needless to say, the bird met all the flight parameters called for in the final thesis. This included a slow fly-by at less than 20 mph. I cheated a bit using the help of a 5 mph head wind, but who cared as long as I got these guys to graduate? We took a bunch of aerial shots, most looking like what you'd see from an airliner...like little quilts on the ground. Landing was another no sweat affair; the bird settling like it had flown a hundred times before. Wow, I really did it, and was I relieved. We all celebrated a bit and then called it quits, opting not to push our luck before the diplomas were handed out. What an experience.

This month, let's discuss the split elevator. Many pilots know what this is, but do they really understand what it does for them? Let's explore it for just a bit.

If you haven't noticed by now, more and more kits are starting to use the split elevators at the rear. Some folks look at this as an easy way out of some hardware for the manufacturer because there is less to it. But actually, the split elevators are there to enhance the flight trimming of the ship, and you get to determine the fine tuning.

Basically, the split elevators allow fine roll correction from the elevator halves. I'm talking about very fine control; of the



Chris Willert performs a final inspection of the radio installation inside the ship before the maiden flight. The engineering team effort was well thought out, resulting in a successful project.

type that would rear its ugly head when pulling up into loops and verticals, but not in straight and level flight. What happens is that because the surfaces are slightly off (or can be) in a joined elevator, the ship will produce a slight rolling action when the elevator is deflected into the loops or verticals. What most pilots believe is that the rudder is not trimmed because they misinterpret the deviation as a yaw movement, rather than a rolling movement.

In the split elevators, the individual elevator halves are adjusted separately to compensate for this rolling action. That is as long as the pilot can detect the correct deviation. Here's how to identify it correctly.

With the aircraft trimmed for straight and level flight, pull the ship up into a loop and watch it carefully. If there is any deviation from the straight and true path upward, watch to see what the deviation is. Let's say the ship went left. You must look to see if the left wing dipped and created the left deviation, or if the wings stayed level and the ship tipped or yawed left. Normally, most pilots will add right rudder, but the ship will continue to drop that left wing if the elevator was the culprit. If this is what happened to you, then you probably have a left elevator half which is slightly higher than the right half. (This is assuming that the ship is built straight and is correctly balanced.)

I have found that the easiest way to insure the elevator halves are even is to place the bird at rest on any hard and smooth surface. Making sure that the stab is absolutely parallel to the ground at both tips, measure the distance from the ground to the outboard tips of the elevator halves. They should measure exactly the same. If not, correct them. The same is now done at the inboard tips. These should measure the same as well. If not, then one of those halves is warped. If this is you, shame on you. A warped elevator half will be hard, at best, to correct without replacement. If this is the case, then so be it. Take the elevator half that is warped and burn it, and make a new one to take its place.

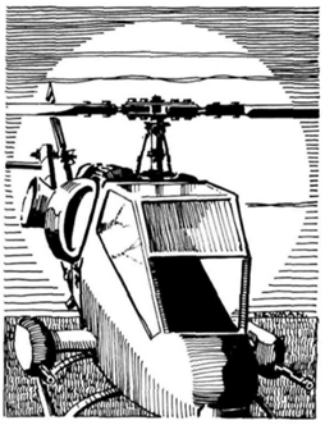
Once the elevator halves are determined to be even and correct, the acid test comes in the air again. Once again, perform the looping maneuver. If the ship loops well, then that's pretty good. Now, with full power, stand the ship on its tail and perform an absolutely straight-up vertical path. Watch carefully again. You are looking for even the slightest roll during this vertical climb. If there's a slight amount of unevenness, here's where it will let you know.

Once you get this technique down, you will be hard pressed to go back to using the standard joined elevator in your ships. The split elevators can really fine tune the precision-patterned bird, making the art of flying easier and allowing more time for you to think. Life is a bear with a bird that you have to fight, let alone try and compete with.

By the time you read this month's column, it will be in the last quarter of the year and the leaves will have turned color. That also means that some of you pilots should start studying the new 1988 pattern schedules. Changes have occurred in at least two of the classes, and FAI is all new. If you start practicing now, you'll be really prime for January (if you live in the sun belt states). If you are one of those pilots who live in the other parts of the country with "normal" weather, then you can bone up on your flying with the use of the home computer. There are at least two pieces of software that I know of which can simulate R/C flying. The best known is Dave Brown's simulator program for the Commodore, the Atari, and now the IBM computer. The IBM version is the fastest responding one with a screen refresh rate of 17 cycles per second. The other simulator program is Jet from Microprose. Now, this isn't really an R/C simulator, but if you fly the fighter from the control tower, it is just about as R/C as fighter flying can get. No match for the Dave Brown simulator, Jet was meant for recreational games. Try one for some finger exercise, and tell them we sent ya. Till next time, we're on the pipe and airborne.

**The following is the address of the manufacturer mentioned in this article:*

Dave Brown Products, 4560 Layhigh Road, Hamilton, OH 45013. ■



Helicopter Challe

by CRAIG HATH

Linkages, maintenance & problem avoidance...

IF THE ONLY REAL constant in our world is change, then our hobby is no exception. There are some fine new products entering the market for us lucky modelers to feast on! In the past year, we have seen at least four completely new kits enter the marketplace. There are new fuselage kits available, as well as lots of new accessories. Keeping abreast of these new products is now beginning to be quite a task. My conversations with modelers around the country have shown that there are many ways to approach the sport, and that there now exists so many choices of high-quality merchandise that it is practically impossible to make a poor selection. With all of these choices now available, a little advice is in order. Be sure that you know exactly what an accessory is intended to do for your helicopter. For example, accessories that are designed to enhance a certain maneuver or style of flight may compromise some of the qualities of your helicopter. Examples of this include mixing arms that are designed to increase cyclic response for making aerobatics simpler yet take away some of the hovering stability. Or, heavily weighted rotor blades, that make autorotation landings easier, yet diminish aerobatic capability. When you are considering buying an accessory, always ask your supplier if the part may have any negative effect on your machine so that you can be the judge if the result will fit into your style of flying.

In the previous issue, we began to cover the details of fine trimming the average model helicopter. The first step was to correctly install the tail rotor pitch control linkage, and to be sure that there is no binding or slop. Let's take a closer look at the linkage and what some of the potential problems are.

The easiest way to check for problems with any linkage is to disconnect

This is a close-up detail of the tail rotor pitch system of the new GMP Stork SE, which the author is in the process of reviewing. This system proved to be very positive and accurate.

it from the servo and actuate the linkage by hand. The result should be that every part moves very smoothly and with little effort. If you feel the linkage stick at any point in the travel, repeat the motion over and over as you trace the movement of the linkage along it's path. If the cause is not visible, then you should start disconnecting the pieces attached to the linkage one-at-a-time until you find the binding part. An example would be to remove the link from one of the tail rotor blade grips, repeat the movement of the linkage to test for the bind, and then remove the link from the other tail rotor blade grip and test it again if the bind is still present.

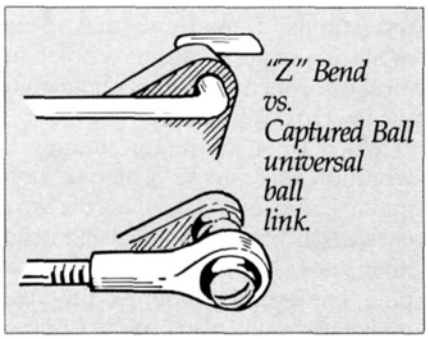
Although there can be many causes for the binding, once you have located the problem, the fix is usually obvious. There can be metal flash on a part, a part may not be polished, and it may be bent or even improperly machined or molded. Whatever the case, fix it! If you really can't figure out why a part binds, replace the part with a new piece; don't try to live with the problem. If you do the result will be a machine that will respond erratically to the control input, and this can be very unnerving. Keep in mind that we are striving to build a "perfect" flying helicopter that will come close to a hands-off hover once it is trimmed.

The opposite of binding on a control linkage is slop. Slop can have the same effect as binding because even though you are moving the control, nothing is happening until you move it a lot, and then it is usually too much. This is very critical on the helicopter because there really does not seem to be a natural neutral for any control. At least I have never felt that there was. You must be able to precisely adjust each control in minute increments and have it return to that exact position every time you move the control from neutral. Removing all of the slop from control linkages is much more difficult then removing binds because it usually involves replacing and upgrading parts in addition to a lot of hand fitting. Even so, make an effort to set your linkages up as slop free as possible, and work towards improving them constantly.

The method that I use to check for slop in the tail rotor linkage is as follows: Turn your radio system on and check the tail rotor servo for proper operation. Hold each of the tail rotor blades between two fingers (squeeze the blades lightly between the leading and trailing edges). Try to move the blades as they would move if you were giving a tail rotor command with the transmitter. As you are trying to move the blades, work in both directions and observe the amount of travel that is possible before any force is required to move the blade further. In other words, move the blades gently and try to feel for slop in the linkage. A perfect set-up will not allow for any movement at all. A few thousandths of an inch is normal, and generally acceptable. Anything over one sixteenth of an inch is generally unacceptable. Some of the things to

look for include not having the pitch control rod anchored to the tail boom and frames in enough places as this will usually allow the blades to flex in one direction and not in another. Or there might be play in the servo output (ball bearing supported servo output shafts will usually solve this). You should also check the pitch control rod where it connects to the servo and to the pitch control bellcrank in the back, which brings us to another problem.

The best method for connecting any linkage to any servo is the universal ball link. These links have the ability to last for a long time and allow for the conversion of rotary motion to linear motion very well as they permit the linkage to move at compound angles.



The Z-bend versus the universal ball and link. The universal ball link hooked to the servo will give much improved performance in the long run. See text for details.

Some of the kits on the market only include the linkage parts needed for making connections to the servos with the wire bent on the end in the shape of a Z. The "Z" bend is prone to wearing out the hole in the servo output arm and becoming loose in a short time. If you have access to the linkage pieces required to convert to universal ball links, do so. If you don't have the parts, you should plan on the conversion as soon as you can. The difference this makes in the way the helicopter flies is substantial, so the extra cost is worth it.

A final suggestion for improving the tail rotor pitch control linkage is to replace the polypropylene tubing used as the pushrod (this is often referred to as Nyrod) with a length of one-sixteenth inch diameter music wire. This can be run inside the outer tubing from the original system or, even better, can be clamped to the tail boom. Miniature Aircraft USA*, and Schluter* have clamps which are specially molded for this purpose. The clamps wrap around the tail boom and encompass the wire once the two ends are screwed together. This system has the added benefit of a more finished look verses the use of electrical tape wrapped around plastic tubing.

Now that we have the tail rotor linkage installed and operating perfectly, the time has come to begin flight adjustment. The helicopter should be checked thoroughly before flying to be sure everything is hooked up and is working properly (remember your preflight check list). Also, we will need to set the radio system back to the bare essentials before attempting any flight trimming. If your transmitter incorporates a mixing system for countering torque at the tail rotor (ATS or Anti-Torqued System), be sure that the system is turned off. If you are using a gyrosensor on your model, be sure that it is also turned off. Check the pitch of the tail rotor blades with the control stick in the neutral position to confirm that they are set to the approximate pitch recommended by the kit manufacturer. Finally, check to be sure that the tail rotor blades swing in the blade gribs. Never tighten down the tail rotor blades or leave the bolts so loose that the blades are sloppy. Both of these conditions have an adverse effect on the helicopter.

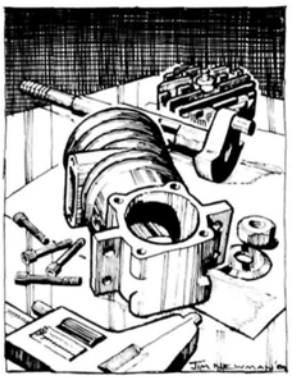
Hopefully, the helicopter will be fairly close to a good state of trim relative to the other controls of the helicopter so that attention can be paid to the tail rotor. Begin testing the tail rotor for trim by lifting the helicopter into a hover, and observing in which direction the nose wants to drift. Be sure that the

The owner of this unique Schluter Champion is unknown. Notice the use of foam board slabs cut to resemble the profile of a Huey Cobra. We caught this machine while visiting at the AMA nationals.

nose is directly pointed into the wind (try to pick a fairly calm day for these tests). Main rotor speed should be "normal", meaning the speed at which you will hover the helicopter on a regular basis. Any change in main rotor rpm will effect the tail rotor trim. We are only concerned with the trim when the helicopter is in the hover attitude as we will adjust for other conditions by using the anti-torque system in the transmitter (which will be the subject of next months column).

If you are just getting started on learning to fly, do not attempt to hold the helicopter in a hover. Instead, lift the helicopter off the ground and let it rise slowly about two feet; then land the helicopter gently. Pay attention to the nose of the helicopter. Did the nose try to head in one direction or the other after the helicopter became airborne? Do not confuse the action of the nose at lift off with the action of the nose while airborne as the helicopter is responding to "ground effect", which tends to

(Continued on page 100)



About Those Engin

by JOE WAGNER

I GOT A LETTER recently from Herb Wahl, the man in Forksville, PA, who has been making replica Browns, Ohlsson Gold Seals, and Hurlemans for the last twenty years. Herb is now also manufacturing replicas of the 1940 Bunch Tiger Aero engine, and recently encountered a minor mystery in testing his prototypes.

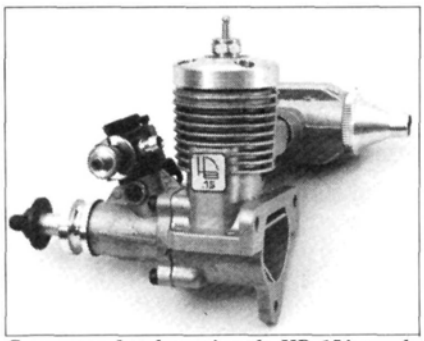
His first engines had the usual style of crankshaft, with a counterbalance machined opposite the crankpin. These ran alright, but tended to vibrate more than Herb liked. He then did some experimenting with different counterbalance arrangements and found, to his surprise, that the engines ran smoothest with no counterbalance at all!

He asked if I could explain this oddity, knowing that I've been involved with vibration analysis for quite a while, both with model engines and with aerospace equipment. (I'm an aeronautical engineer, semi-retired now.)

Out-of-balance vibration is mysterious alright, and often seems to behave in strange ways. Much misunderstanding about it comes from looking at only the static part of the picture. For instance, consider an automobile wheel which can be in perfect balance on a static balance machine yet shake furiously on the highway at 45 mph. With model airplane engines, we have a different and far more complex situation.

A model motor's crankshaft can easily be counterweighted to statically balance the weight of the piston-rod assembly. Doing this, however, merely transfers the unbalanced effect from up-and-down to side-to-side as the shaft rotates.

Thus, it's long been model engine practice to make the crankshaft counterweight equal to half the reciprocating mass (piston, wristpin, and upper half of the rod) plus all the rotating mass (crankpin and lower half of the rod). The idea is to split the vibration between the



Compact and cool-running, the HB .15 is nearly vibrationless. It was off the market for a while but is now available again.

vertical and transverse directions; taking half the unbalance out of the reciprocating motion and transferring it to the lateral direction. Theoretically, this reduces the overall vibration level by 30%.

However, this doesn't always work so neatly in practice. The reasons are dynamic. First, *resonance*—a matching of frequency—is involved. Example: a child in a swing can be swung very high with a series of gentle pushes delivered at just the right instant. Conversely, you can push the same child in the swing quite hard without making him go far if your pushes are out of phase with the swing's motion.

One of the main reasons the conventional method of counterbalancing a model engine sometimes fails in practice is that the motor's vertical-resonant frequency can be much different than the lateral. This is especially true in tall engines such as old-timers.

The width of a modern short-stroke motor such as an HB .15 isn't much less than its height, and the main masses are close together. Crankshaft counterweighting in such an engine does reduce vibration levels. On a Brown or a Bunch or an Orwick, however, things are different.

In the vertical plane there's a lineup of forces, masses, and mechanical structure on a common centerline. The forces acting in this direction, whether power impulses or the effects of unbalance, occur where the motor's structure is strongest and most symmetrical—and has the highest natural vibration frequency.

Thus, a typical long-stroke engine such as an Orwick is well able to resist and absorb the vertical vibration it produces provided that it's firmly mounted. Hank Orwick intended the engines he designed to be radially mounted onto rigidly reinforced firewalls. (The separate, little mounting lugs added on the "64" were a concession to modelers who insisted on putting their engines in models with beam mounts.) But bolt an Orwick on a beam mount that's not rigidly supported and it vibrates viciously.

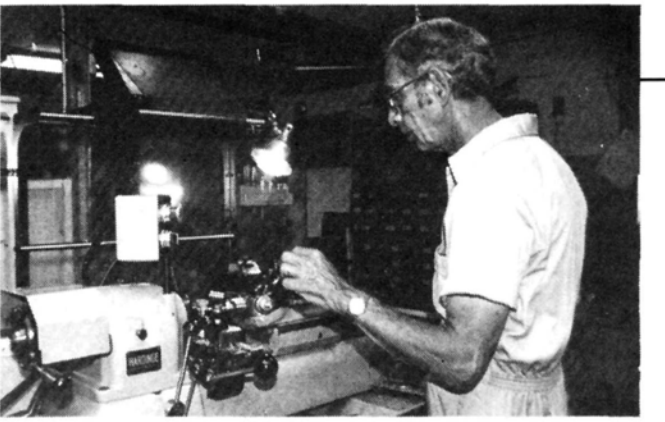
I encountered this myself recently in running-in an Orwick 64. Since its peculiar mounts won't fit in any of my test stands, I made a quick beam-mounting setup by cutting a notch in a piece of ½-inch oak lumber, and bolted the big Orwick in place.

When I got the motor running the vibration was intense. The oak motor mount had an overhang of maybe two inches, and my setup was much like a short diving board. There wasn't much damping, but when I remounted the engine radially on a solid maple block, it ran very smoothly.

When a standard crankshaft counterbalance is used on a long-stroke engine, half the vertical unbalance effect gets transferred to the lateral direction—in which the engine is unsymmetrical—with its center of gravity well above its mounting flanges. Then its dynamic vibration characteristics become much like those of a tuning fork.

Even if it's solidly clamped to its mount, a tall engine can still vibrate a bit from side to side because of the elasticity of its metal. And if its resonant frequency is close to its operating rpm, it's going to shake—a lot.

That's why an un-counterbalanced crankshaft can make a smoother-run-



Herb Wahl at work, making crankcases for 'Tiger Aero" .45 engines. His factory is small but equipped with the latest in machine tools.

ning engine. The side-to-side unbalance is minimal, and no "tuning fork" vibration occurs. The vertical imbalance is still there, but it's acting in a direction where the engine is well-suited to absorb it. Also, the vertical resonant frequency is likely to be much higher than the lateral frequency. That means the engine's out-of-balance impulses will be out of phase with its vertical resonant frequency. The effect is like that of pushing a swing at the wrong rhythm.

The second reason that conventional static-type crankshaft balancing doesn't work as it seems it should in a model engine is that the reciprocating motion of the piston is not truly free.

Consider a clock pendulum. Its dynamic behavior can be calculated accurately from static analysis of its mass and length because in motion it's essentially frictionless. If it happens to rub on the clock case in its back-and-forth swinging, its motion won't be as predicted. In fact, the clock will probably stop.

We have a similar situation in a model engine. On the upstroke some of the piston's energy gets absorbed in compressing the fuel-air mix. Some is also lost in friction.

On the downstroke the piston is more free and still has friction losses, but it must compress the gases in the case. Thus, its downward impetus is less than static analysis predicts. (The power stroke does not in itself produce an unbalanced effect; the pressure in the cylinder is the same in all directions: upward against the underside of the head just the same as downward against the piston-rod-shaft linkage.)

Genial Herb Wahl with two of his famous old-time engine replicas: a Brown Jr. .60 and an Ohlsson "Gold Seal" .57.

Also, there is a small but significant shock-absorbing effect in the oil-filled clearances between piston, wristpin, and crankpin.

That pretty well explains what I know about the principles of model engine counterbalancing. In any case, pragmatism always takes precedence over theory. If something works it must be right, even if it appears to violate theory. And, on the other hand, if something fails to work it must be wrong, even if it seems to be completely in accordance with "scientific law."

Back when Thomas Edison was developing the first electric incandescent lighting system, the great British scientist Lord Kelvin (for whom the Kelvin temperature scale is named) proved mathematically that it could never work. He was not a fool, and his math was quite correct. But didn't have enough "engineering data" to make his conclusions valid.

Obtaining sufficient data is one of the problems of engineering, of course. Most of the time when a designer is developing something new he doesn't have nearly all the information he'd like. He has to play it by ear, try what looks right, and then test it and make whatever changes seem advisable. Finally, when the device is working pretty well he can usually go back and re-analyze the design, and discover the data that he wished he'd had when he started.

At Veco 35 years ago, while working with Mel Anderson on the early Veco .35 design, I was racing sports cars in a small way in my spare time. It was common knowledge among race car owners that the first thing to do in "hopping up" an automobile engine was to balance it as perfectly as possible.

I asked Mel why we couldn't put something like a harmonic balancer on a model airplane engine. After all, if power could be gained in a car motor merely by bringing it into balance and eliminating its power-wasting vibration, why wouldn't the same thing hold true for a model engine? Mel said, "It just won't work. I don't know why, exactly, but it won't."

I was full of youthful enthusiasm in those days (1952) and decided to try the thing out for myself, just to see. I made up a quick-and-dirty harmonic balancer that fit inside a Froom spinner and put it on a Veco .29 (a kind of rough-running engine due to its heavy Meehanite piston).

I mounted this lashup in our dynamic test stand and started it up. The smoothness was amazing! It was almost like an electric motor. There was just one drawback—about a 30% power loss.

Then, of course, it dawned on me. My harmonic balancer was stealing a third of the engine's power to counteract its inherent imbalance. That put an end to that particular line of experimentation! ■

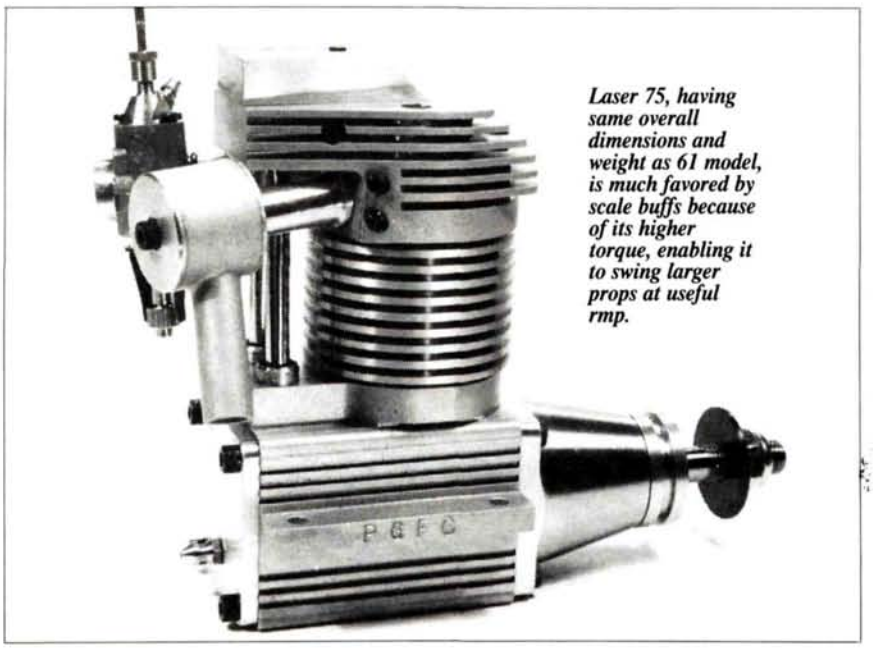
Engine Review

Laser, No. 1 British 4-stroke, is available in six displacements from a .45 to 1.5 cu in. vee-twin. This is the popular "75" model.

by PETER CHINN

LASER 75 4 STROKE

Unique, solely British, four stroke of sound design



Laser 75, having same overall dimensions and weight as 61 model, is much favored by scale buffs because of its higher torque, enabling it to swing larger props at useful rmp.

SPECIFICATIONS

Type: Single-cylinder, glowplug-ignition, four-stroke-cycle, with pushrod operated overhead valves. Twin ball-bearing crankshaft. Twin camshafts supported in bronze bearings. Timing pinion shaft supported in single ball-bearing. Throttle type carburetor with automatic mixture control.

Checked Weight: 706 grams (24.9 oz) with muffler

Displacement: 0.7433 cu in. (12.18cc)

Bore: 1.040 in. (26.42 mm)

Stroke: 0.875 in. (22.22 mm)

Stroke/Bore Ratio: 0.841:1

Nominal Compression Ratio: 9.2:1

Performance Data—as tested:

Power Output, Net: 1.08 bhp at 11,100 rpm

Torque, Net: 112 oz-in at 8,000 rpm

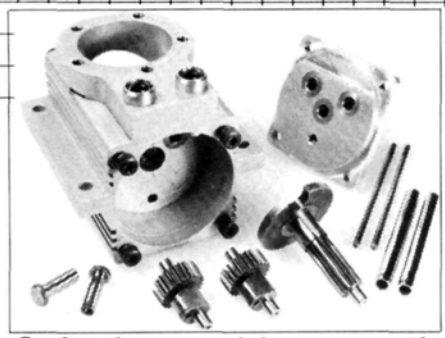
Equivalent b.m.e.p.: 118 lb/sq in.

Specific Output, Net: 1.45 bhp/cu.in.

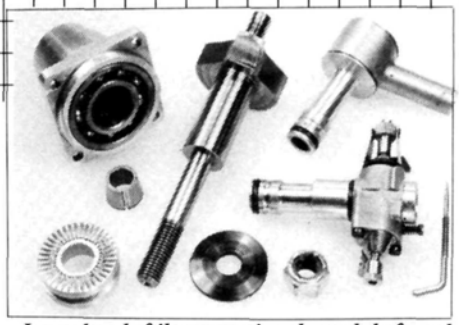
Power/Weight Ratio, Net: 0.69 bhp/lb.

Manufacturer: A.G.C. Sales Ltd., London Road, Apsley, Hemel Hempstead, Hertfordshire HP3 9ST, England.

Sales & Service: Direct—see text.

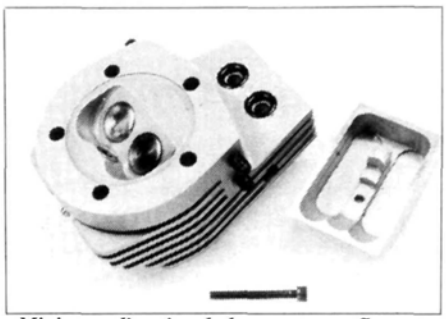


Crankcase incorporates timing case at rear. Also shown, clockwise: backplate, pushrods and covers, timing shaft, twin camshafts and mushroom-type cam followers.



Laser has heftily proportioned crankshaft and sturdy front-end bearings. Also shown here are muffler and ST "Mag"-type carburetor.

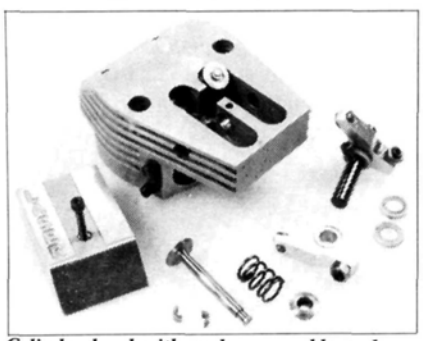
Laser "hourglass" piston is unique (see text). Also shown are cylinder-liner annd finned jacket, connecting-rod and wristpin.



Minimum directional changes to gas flow are achieved by straight inlet and exhaust pipes and inclined valves.

FOUR-STROKE-CYCLE model engines have been made in the British Isles for many years. Long before the O.S. FS-60 sparked off the four-stroke revolution in 1976, the Gannet single and inline-twin cylinder marine engines, for example, were being produced in England and many of them exported to the U.S. Earlier still, the Jensen C.I. Special appeared, a full quarter-century ahead of its time, just when, as luck would have it, the hobby was in the grip of the control-line craze for which only fast-revving two-strokes were in demand. Disgusted with the modeling public's poor response to their masterpiece, the manufacturers, J. & G. Jensen, sold off their remaining stocks of engines and parts to a company in Liverpool, from where most of them were subsequently exported to the United States. Nowadays, the C.I. Special is so highly regarded by collectors that connoisseurs will pay up to twenty times its original price for a mint condition example of this 40-year-old design.

The most successful modern British four-stroke is the Laser. It is also the only British product to be dealt with out of a total of twenty-eight different four-strokes featured in our M.A.N. Engine Review test series to date. We previously tried to redress the balance, some three years ago, with a test report on another English-made four-stroke; but it was judged that the U.S. importer, at the time, was providing inadequate back-up on this engine and, to protect M.A.N. readers from disappointment, the editor decided not to publish the report.



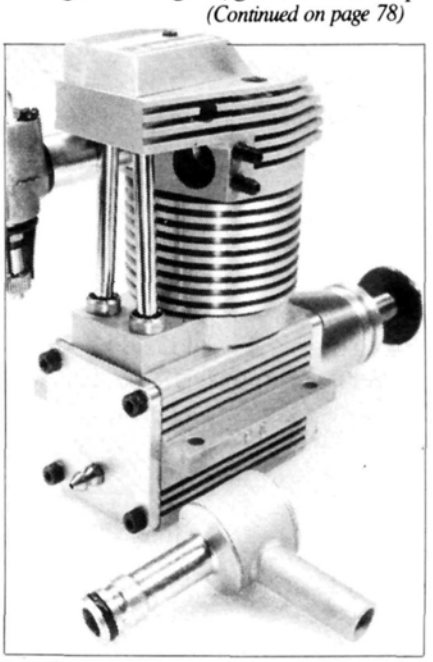
Cylinder head with rocker assembly and one valve removed. Rocker arms are of aluminum alloy. Valve springs are retained by split cotters.

No such criticisms are valid in the case of the Laser. When you buy a Laser, you have to order it direct from the manufacturer in England. Jealous of their good reputation, the Laser people have decided that they will only deal directly with their customers. You may think that this is a disadvantage, inasmuch as you cannot, in advance, see what you are buying—unless you happen to know someone who already has an example of a Laser—but there are attractions which, some would say, substantially outweigh such a disadvantage.

Because Lasers are not distributed through dealers, wholesalers and/or importers (and this applies to all markets, the U.K. market included) they can be sold at a competitive price. This is important because Lasers are essentially "bar-stock" motors, machined from the solid and made in much smaller quantities than the volume-produced die-cast engines turned out by the big Japanese manufacturers.

The mere fact that you have to deal directly with the manufacturer, establishes a personal link between the user and the factory which can be valuable if you need service or advice. In the literature that comes with your Laser, Neil Tidey, the engine's designer, gives a lot of help-

(Continued on page 78)



Cylinder head is distinguished by efficient wedge-shaped combustion chamber, with inclined valves and well-located glowplug.

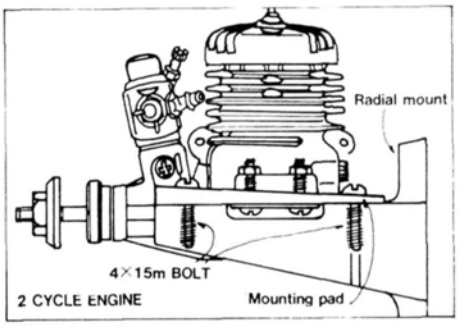
CHEROKEE 40

(Continued from page 27)

achieved limited success. I balanced props and spinners and checked the mount for tightness. It improved, but not as much as I would have liked. This vibration is most pronounced at idle and in the mid-range. High end is much better. In the power department, though, the engine, fitted with a TF 11x6 prop on 10% nitro, will haul the five-pound Cherokee vertically to nearly out of sight from a standard take off roll.

FLYING.

As easy to assemble as this kit is, the real fun begins when it comes to flying it. On the first day we logged five flights with Nick Ziroli flying it for the pictures, followed by our alternating turns at the transmitter. It was during this session that we discovered the brute power provided by the Fox. You can literally do rudder tail wags in the vertical. Stall turns come when you come off the power and feed in rudder, not just when you run out of vertical velocity. The roll rate is moderate with the ailerons set up to provide the 3/16-inch throw I've already mentioned. One of the really pleasant qualities of the Cherokee is its ability to slow-fly without the airplane getting twitchy or the controls becoming really mushy. This is a really delightful airplane for drag-it-in, spot-landing practice.



This illustration, from the assembly manual doesn't really mean you need to machine the downthrust into the engine lugs.

I've now got twenty-nine flights on it. The engine is smoothing out somewhat and the airframe is holding up well. It is still an absolute ball to fly, although probably not for the beginner. The comfortable intermediate flyer will find it spirited and responsive but not at all nasty. Throttled back it becomes docile enough for the accomplished novice, who can gain experience as he/she adds power.

The Hobby Kingdom Cherokee 40 is a very attractively priced sport model which is easy to assemble and fun to fly. With the exception of the L.G. mount problem, it is well put together and will get you into the air in short order. Powered by something as formidable as the Fox .45, it represents rapid transit in one of its purest forms, and I'm certain that less potent engines would be more than adequate. A healthy .40-.48 four stroker would be nearly ideal for scale-type flying. Take a close look at this one!

**The following is the address of the manufacturer mentioned in this article:*

Sunshine Hobbies, 17221 S. Western Ave., Gardenia, CA 90247. ■

by Art Schroeder

Left: Byron Godberson and his fifth-scale USS Hornet. Right, Byron BD5-J with pilot of full-scale, Dave Hoover at right.

Byron's big bash took on a new look with combined giant scale and ducted fans for 1987. It also presented an enlarged and even more spectacular airshow!

I HAVE BEEN a Giant and Jet football fan for years! But little did I know I would be seeing giants and jets, far from the Meadowlands stadium, on a field in Iowa in August. I was much more impressed in Iowa with modeling's giants and jets than I've ever been with the football variety; Super Bowl not withstanding. Actually, Super Bowl is not a bad reference since the Iowa affair has become a "Super Bowl" of modeling events! All by way of introducing Byron Originals 1987 Aviation Expo held in Ida Grove, Iowa, August 12-16.

I have been privileged to attend most of the modeling/airshow events in Ida Grove, and each year I leave feeling that what I've

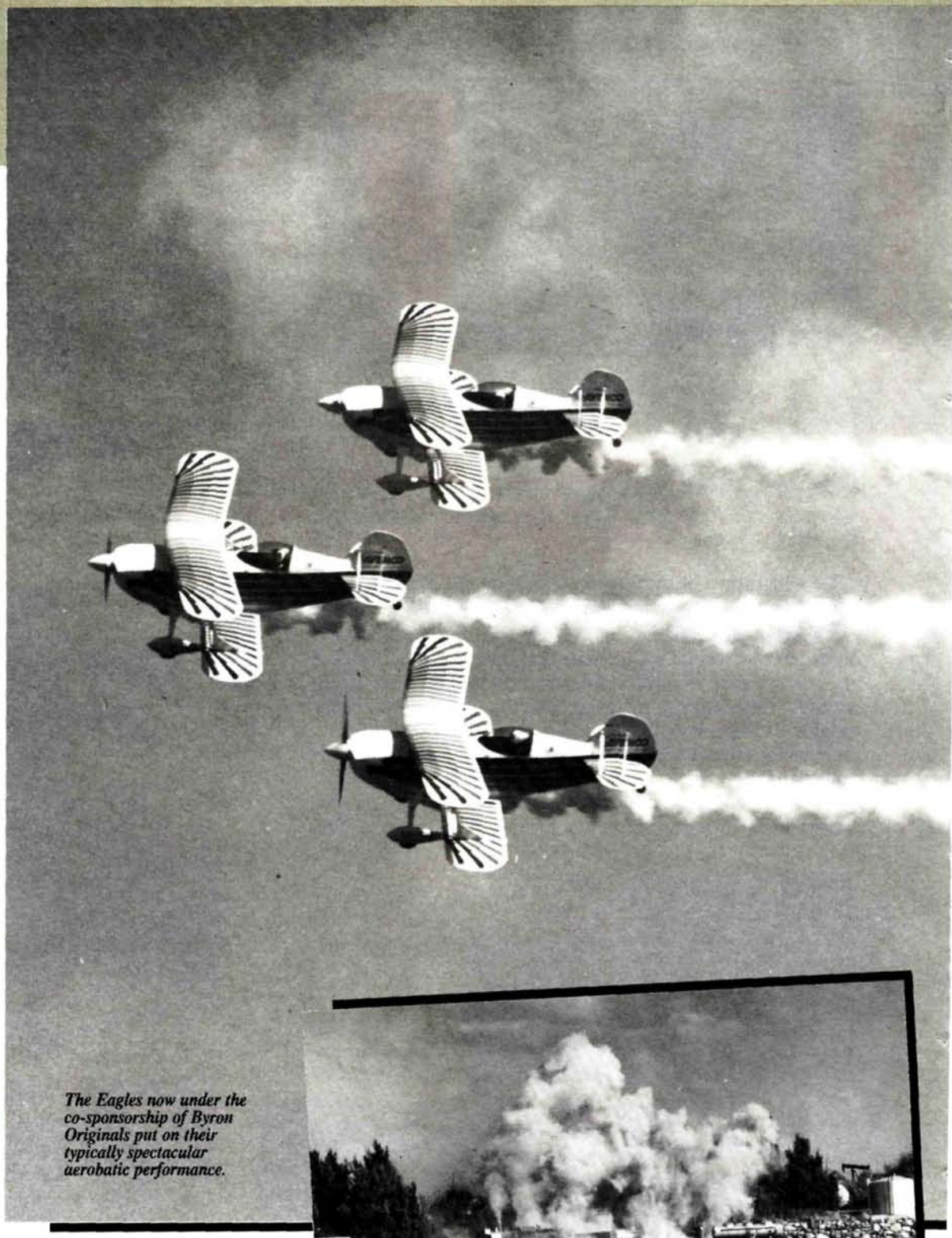
Don Muddiman and his flying machine give unprecedented free-style aerobatics show.

Eliot Berelson and his Ziroli Folker DR-1.

One-fifth-scale B29 Superfortress powered by four Quadras.

seen was great and that the crew at Byron Originals* could never top their effort. Each time I've returned to find out that I was wrong! Each successive year has been bigger, better, and more spectacular. This year was no exception.

Consider the advances this year: a combined fan jet and giant scale meeting that enlarged attendance and gave a new texture to the event; an expansion to five full days that gave both modeling styles full opportunity to display their airplanes and skills; an outstanding array of modeling symposiums that covered topics of great interest and were well attended; vastly improved automobile traffic control for spectators and flyers; an airshow that included old favorites such as the Eagles, skydivers, and warbirds, but with added spectaculars such as the Coors Silver Bullet and a tactical display by a Fairchild Republic A-10 Thunderbolt II; a true display of modeling talent by Florida's Cloud Dancers and Seattle's Sky Riders; two full flights of the Byron B-29; and Striking Back in a bigger format over an enlarged stage area that included two 1/5th scale aircraft carriers and two 1/5th scale PT boats. Truly, 1987's Aviation Expo was a spectacular event to end all events, although I think Byron Godberson and his cast and crew will top it all in 1988.



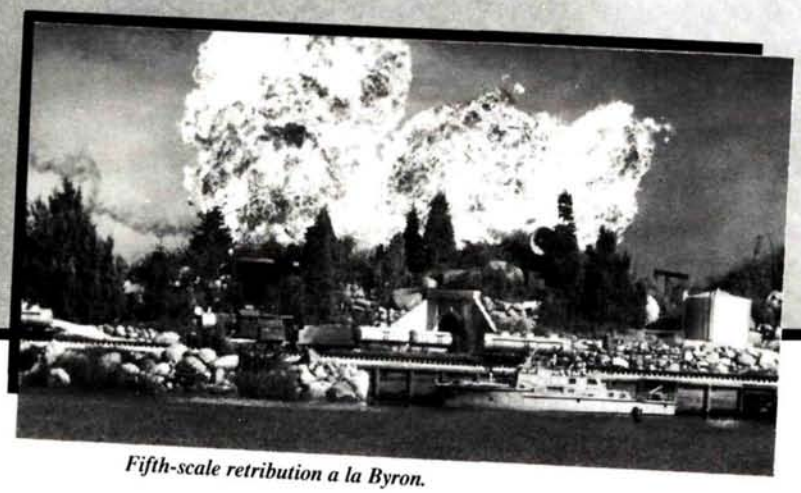
The Eagles now under the co-sponsorship of Byron Originals put on their typically spectacular aerobatic performance.

Japanese fifth-scale freight train being strafed by the Byron fifth-scale air force.

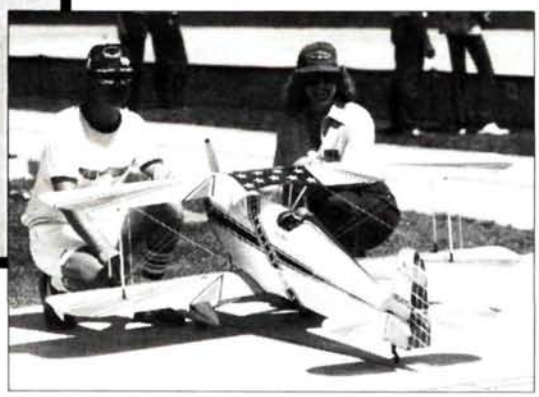
Weather was, by and large, quite good with bad parts mainly reserved for the nighttime hours. There were some strong crosswinds for the latter days tht precluded flights of the B-29, but they did not slow down regular model flying or Striking Back.

There were plenty of models flying at Ida Grove. By Saturday, 366 pilots had arrived with well over 400 airplanes. The breakdown reported to me was seventy percent giant and thirty percent jet. Over the course of five days, 926 flights of

Maxey and Hazel Hestor with the newest Space Walker powered by O.S. 240 Pegasus.



Fifth-scale retribution a la Byron.



Bücker Jungmeister by Paul Grubisch (and the wife) with Webra Bully; superb MonoKote finish.

model aircrafts were accomplished. And there is room for growth. Most times the air was alive with jets or giants, but there were periods when only one or two airplanes were flying, particularly as things wound down on Sunday. Props (or giants) consumed 30 hours, jets 19 hours and show time another 9 hours; the breakdown seemed very fair to all concerned. All this was viewed by a combined attendance of over 50,000 people. Impressive!

Heading my list for super airplanes was a Hall Racer built by Don Neill and flown by Terry Majewski. This dynamic duo from Lincoln, Nebraska, have thrilled crowds at Ida Grove before with flights of a Gee Bee and, this year, the Hall Racer. I've never seen takeoffs and landings so straight and true. This bird was developed from Jeffries' drawings and is powered by

(Continued on page 115)

Field & Bench Review

ROYAL PDQ Cessna 40

by PETER SNEDDON

HIGHLY VISIBLE FINISH AND SUPERB STALL QUALITIES MAKE THIS ONE TAYLOR-MADE FOR THE RANK BEGINNER

Royal Products
PDQ Cessna 40

Type: *High Wing, Sport Trainer, ARF*
Power: *.40-.45*
Span: *62½"*
Wing Loading: *16-18 oz./ft.²*
Weight: *Avg. 4½ lbs. (72 oz.)*
Channels Req'd.: *4*
Suggested Retail Price: *$179.95*
Features: *Pre-fabricated, sheet foam over balsa or light ply structure. Built-in color and markings.*

REMEMBER THE FIRST time you considered R/C? It was probably the same time you saw your first radio-control plane fly. My memories of witnessing that first flight are as clear to me as a baby-blue sky on a weekend. I saw beautiful planes tearing up the sky and wondered if I could ever do that.

It didn't take me long to go to the nearest hobby shop for more information on those fascinating aircraft. At that point, I was anxious to fly and bought a trainer-type model (the store owner convinced me that I couldn't start with a P-51 with retracts), an engine and a radio plus the big bag of extras that was necessary.

Now come the memories of putting that first plane together. I remember opening the box and wondering what magic was needed to transform all this wood into flying machine. Hey, what do you want from a guy who thought dihedral came in a bottle.

My first attempt at building had me thinking that if I could just get my fingers unglued, maybe a few prayers would help my wing turn out straight. I was ready to give up when I realized that reading the end of the construction manual didn't mean I was ready to fly; I still had to cover and fuel-proof. What do you mean I

Royal .40 engine fits with room to spare. Typical ABC "blind" goes away after repeated running.

have to learn how to iron!

Those memories of fumbling with my first radio-control project are special to me, but many will be happy to know that now you can purchase a Royal PDQ Series Cessna 182* along with a radio and engine, and actually be flying in no time.

One of the many good features of this kit is that the bag of extras is no longer an added expense; wheels, tank, control hookups, spinner, aluminum motor mount, engine-mounting hardware are all included.

The Royal Cessna calls for a .40-.45 2-cycle or a .60 4-cycle and has a wingspan of 6½ inches. The fun begins as soon as you open the box and realize that 90% of the work is already completed.

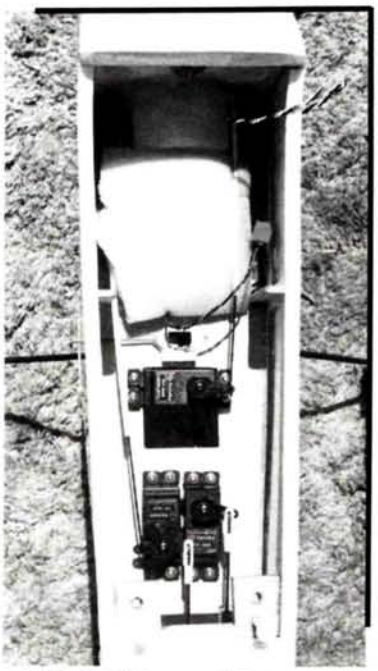
With the Cessna's flawless white and red finish surrounding the foam-on-plywood construction, it doesn't take much to imagine doing touch-and-go's even before starting construction. Obviously PDQ refers to the "Pretty Darn Quick" assembly time.

Royal's buy-today, fly-tomorrow assembly is a good selling point, and I'm sure it's possible, but to be a little more realistic let's take more time for safety's sake. It doesn't take long to tug on hinged surfaces or Loctite a motor mount. The 11-page construction guide and pre-flight checklist includes drawings and explanations in a concise step-by-step format that will make even first-timers feel comfortable.

Wing assembly is first. Parts for assembly include a three-piece wing joiner, plywood leading and trailing edge ribs and wing-mounting dowel.

Be sure to check for warps while the glue dries. The plastic center section is then applied, which needs only slight trimming to clear the dowel. Space for the aileron servo is conveniently pre-cut.

Before epoxying the wing-bolt mounting plate in place, coat the blind nuts on the bottom with a medium cyanoacrylate or epoxy. By doing this, the blind nuts won't come loose if more-than-normal pressure is applied. (This happens when you're anxious to fly.)

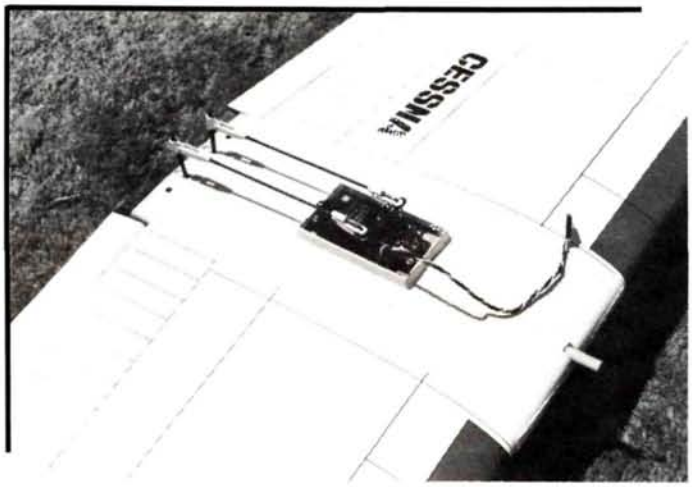


"Wide-body" Cessna will house any size radio. Futaba shown.

Mounting the wing was accomplished by finding the middle of the fuse, lining it up with the center of the wing, then drilling the holes. Bolting the wing to the fuse is where I deviated from the instructions a bit.

Instead of using the metal screws provided, I drilled new holes one half inch behind the center of the blind nuts and tapped for 8-32 nylon bolts. If you decide to do this, it's best to coat the new

(Continued on page 98)



Aileron servo installation is as simple as it can get. Note attractive permanent panel lines.

CONVERSION

EVERY ACCOUNT of aerial combat engagements—from the one about a British flying observer first leveling a sidearm against his adversary in the early 1900s to the gunfighters of Vietnam zapping MiGs—seems to produce its hero warriors. The mounts of these men are almost always included, and preserved as history. The list is legion: Camel, Spad, Mustang, Zeke, Me-109, Lightning, Bearcat, Shooting Star, Panther, Sabre, Thunderchief and Phantom—each having its own chunk of infamy. Tomcat, Eagle and Falcon may join the ranks.

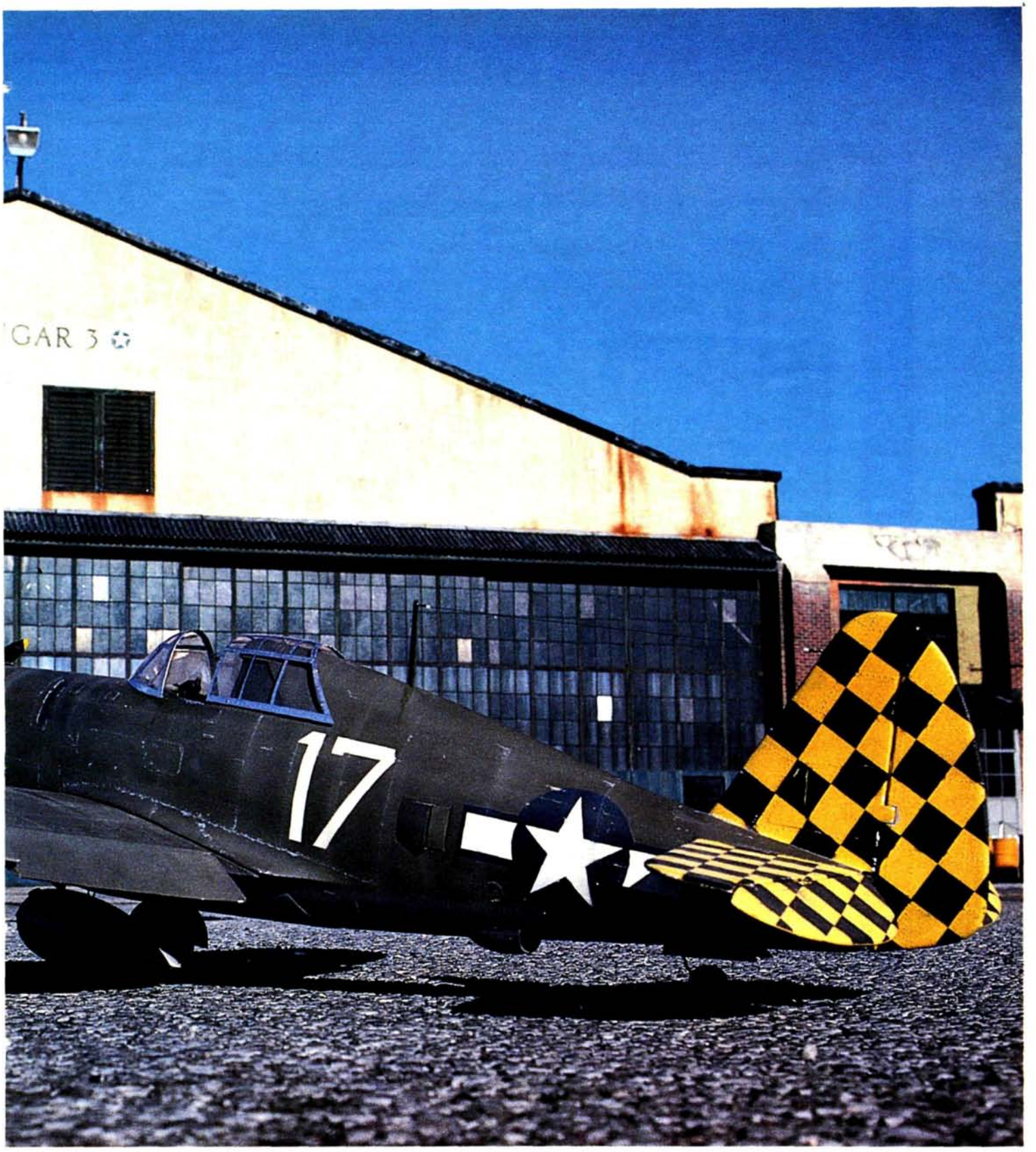
All these fighters have a somewhat-

TOP FLITE P-47 RAZORBACK

practical conversion to a time-proven design.

by RICH URAVITCH

shared heritage from a design standpoint, they are lithe, trim of line, agile and functional airborne steeds.... Enter the classic contradiction, the Republic P-47 Thunderbolt. Affectionately known to its pilots as the "Jug," the P-47 was the brainchild of Alexander Kartveli who, legend has it, first sketched the outline of the Thunderbolt on the back of an envelope en route to a meeting with Air Corps brass. Tracing its lineage back to the Seversky P-35, the Jug went on to sire a line of Thundercraft which included the F-84 Thunderjet of Korean-



conflict fame and the F-105 Thunderchief, one of the work horses of the Vietnam war. The present supergun, the Fairchild Republic A-10A, can proudly claim the P-47 as its directly related ancestor.

Nearly 16,000 P-47s were built, including various one-off prototypes. The production Jugs were flown by virtually all the Allies and even some of the other team since a number of P-47s were captured and assigned to special Luftwaffe squadrons such as Sond. Aufkl. St. 103—a unit which used captured aircraft for special missions, including tactics training and "infiltration" operations.

Relatively few P-47s remain in existence today and even fewer are in flyable condition. My annual treks to Oshkosh, where at least one Jug shows up, reinforce my feeling that the sound and sight of this magnificent machine is something to remember.

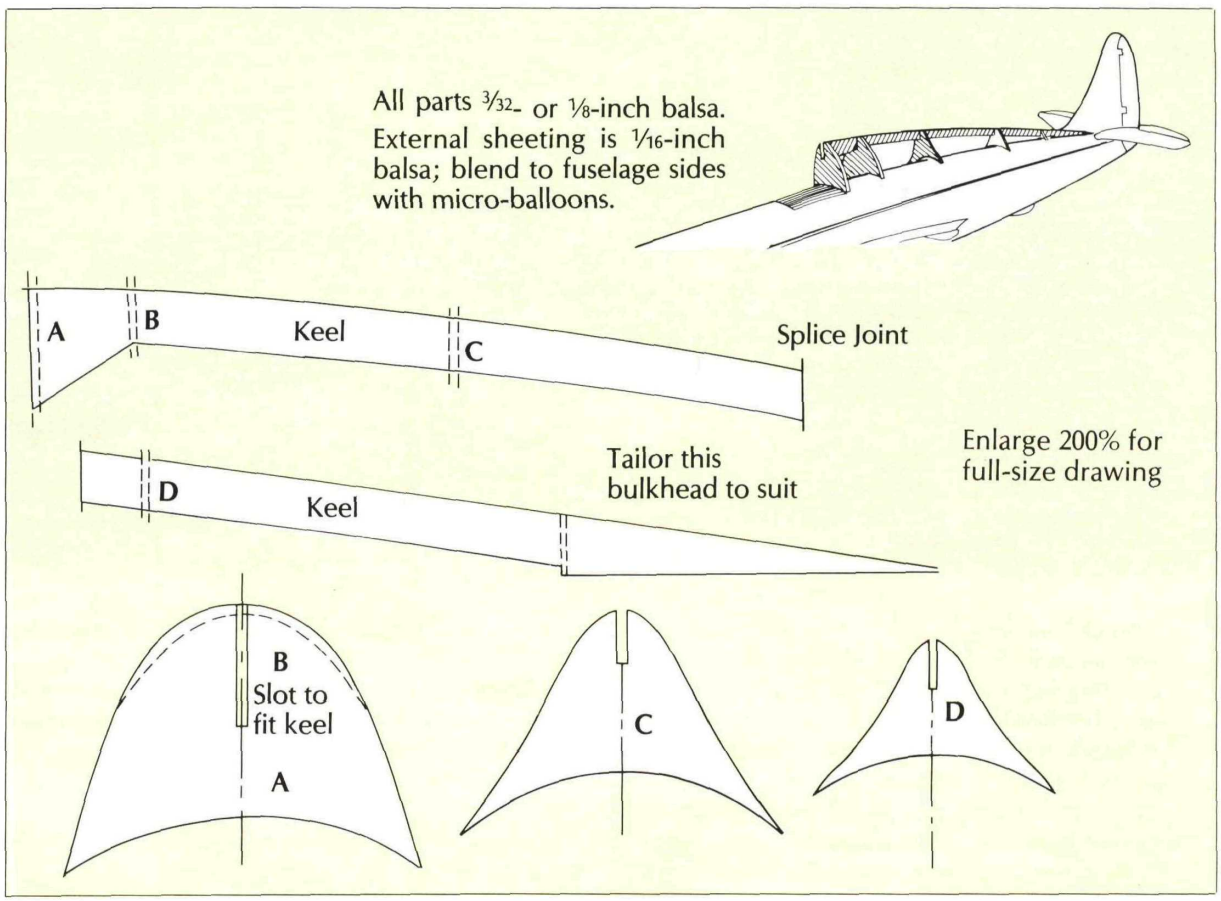
The conversion described here is very easy to accomplish

Top Flite kit provides an excellent basis for this easy-to-do conversion. Distinctive look.

and requires a minimum amount of work and materials. It will provide you with an airplane that retains all the pleasant flying qualities of the original kit (enhanced, perhaps, by the increased side area) and, at the same time, produces the razorback variant of this famous fighter. In my opinion, this variant represents the classic version of the Jug.

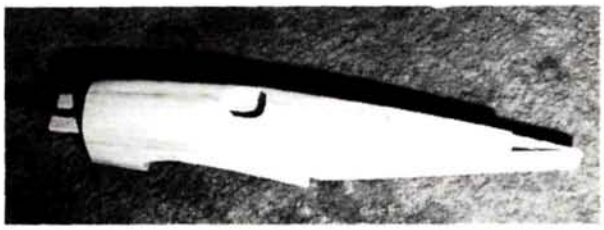
To avoid a blow-by-blow of the basic construction, I'll summarize by saying that Top Flite has done a terrific job on this kit.

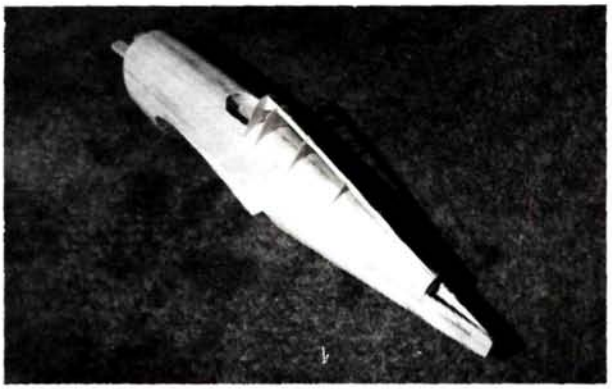
The actual conversion consists of four 3/32-inch balsa bulkheads, a 3/32-inch balsa crutch piece and 1/16-inch balsa sheeting. The pictures show the build-up sequence. The sheeting to fuselage joint is blended



with micro-balloons and sanded. I molded the canopy from .040 CAB (Cellulose-Acetate-Butyrate), which was really the most difficult part of this conversion since it required the fabrication of a mold. After forming the clear section, a duplicate part was molded from .015 polystyrene, the glazed sections removed with a sharp x-acto. This piece was painted prior to being bonded to the previously formed clear canopy. This gives a very realistic frame to the canopy rather than the usual practice of painting the framing on the canopy glass. The rest of the building process is identical to the kit sequence.

After all the woodworking was completed, the airframe was final-sanded, at which point the fuselage and wings were covered with resin-bonded glass cloth. The tail group received two coats of resin without the glass cloth. I'd like to mention here that this was the first airplane on which I used Cheveron Perfect Camouflage paints and found them to be exceptional on all counts. The colors agree with three different reference sources that I used the coverage is excellent as is the durability, and it's virtually odorless. I now have to figure out what to do with the collection of acrylic lacquers I've managed to build up. I'd like to see Cheveron expand their line to include additional colors.



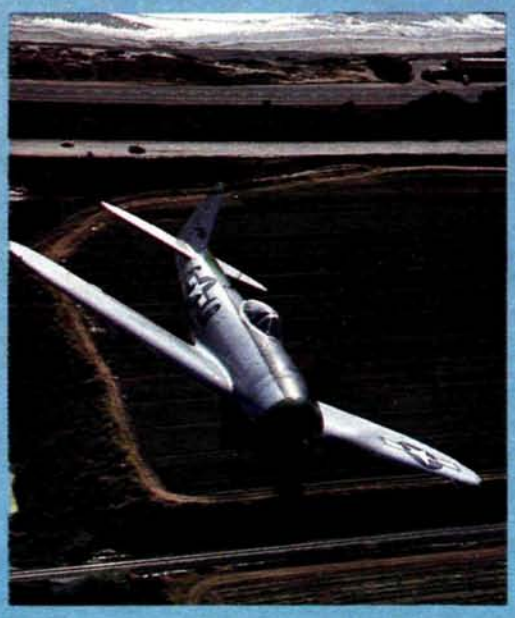


Basic stock fuselage before and after addition of turtledeck structure. Balsa sheeting not yet added.

The markings for the model were taken from a drawing depicting a P-47D-21RE attached to the 317th FS at Foggia, Italy, and flown by a Lt. C.O. Dean. All insignias were either airbrushed through stencils or handpainted. Top Flite, in the P-47, has produced a high-quality, well-engineered kit with excellent flying qualities. Review your documentation, select the markings you like and press on. If it's a bubble you choose, do the kit. If it's a razorback, do the mod. Better yet, do both and you'll have one fine pair of Jugs. ■

We use an airbrush, they use a spray gun...similar results!!

P-47 T



MOST DISCUSSIONS of the P-47 Thunderbolt begin with comments about its size and its rather portly lines. Let's face it, a fragile ballerina it's not. This is your basic Sumo street fighter and it's not known as the "Jug" for nothing. However, in all fairness, comments about the Jug have to be put into perspective with the times, which were changing as fast as lightning about the time the Jug came along.

For one thing, the shooting war was over in Europe, where both sides employed typical European design standards...make it light, make it nimble, and make it pretty. Hence, the looks of the Spitfire and the Bf-109. They were lithe little creatures; more lik high-speed chipmunks than lethal killers.

Until the Jug arrived.

ticle & color photos by BUDD DAVISSON

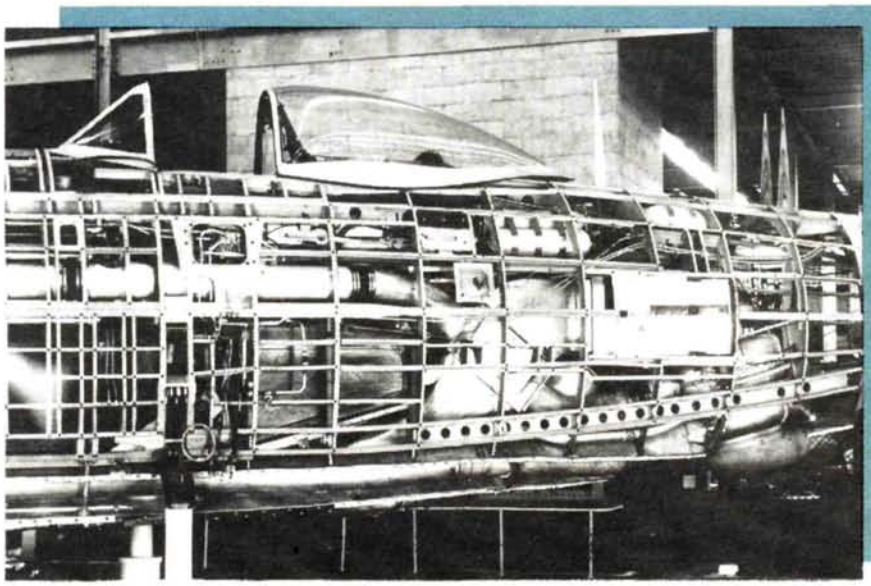
HUNDERBOLT

Prior to the Jug, the only American fighter seen in numbers in Britain was the P-40, which was big and heavy when compared to Britain's machines. They hadn't seen anything, though, until they saw the Jug. One of the popular jokes of the day had to do with the pilot of the P-47 being able to take evasive action in combat by running around inside the Jug's huge fuselage.

How big is the Jug? The prototype weighed in at a shade over 12,000 pounds, but that quickly climbed to 13,000-plus in most combat variations. By the time the final model "N" came along, it tipped the scales in excess of 20,000 pounds! Compare that to a MK I Spitfire at 5,280 pounds, a Bf-109K at 7,438 pounds and a normal weight of 6,026 pounds for the Japanese Zero. A Mustang normally went into combat at around 10,000 pounds, so it can be seen that most American fighters dwarfed their competition especially for the Jug.

Ray Stutsman's razorback "Little Demon" now owned by Bob Waltrip. This Curtiss-built example was one of the fortunate ones to evade the smelters' ovens.

Part of the reason for the gigantic difference in size is the mission for which the airplanes were designed. The Spitfire, for instance, was primarily a defensive weapon. It was meant to be a dog-fighter in the fashion of WWI and wasn't expected to hop continents ina single bound. It was to be poised over the cliffs of Dover like a watchdog to repulse invaders. Airplanes like the Jug and the Mustang were offensive weapons. They were hunters designed specifically to bring the fight to the enemy's front door and put him on the defensive.



De-skinned "N" clearly shows turbo supercharger and intercooler ducting. Spirited performance at altitude.

The design specifications laid down by our government said that our airplanes had to have tremendous ranges, incredible top speeds, and had to carry unprecedented amounts of firepower and ordnance. Not much has changed, has it?

Let's add all this up. To have a wide range the plane would have to carry thousands of pounds of fuel. To fly at top speed the plane would have to have horsepower, which in turn demands more gasoline, and on and on it goes.

When it's all added up, there was no way to build a long-range airplane capable of blasting the devil out of everything in sight, run at over 400 mph, and not have it be a big airplane.

In the case of the Jug, the designers cut right to the bottom line. Since horsepower was the key to their success, they grabbed one of Pratt &

RAF Thunderbolt "landing on" after factory test flight at Republic.

Whitney's new R-2800s, which gave 2,000 horses right from the start. Then Republic's chief designer, Alexander Kartveli, did something never done before...he decided to mount the engine's turbo-supercharger in the rear fuselage to give it more efficient airflow. This required large ducts which so dominated the design that he actually designed that system first and contoured the rest of the fuselage to contain it. The system provided for the ducting of exhaust gases rearward to the turbo and then returning the supercharged air through inter-coolers to the engine. As complicated as it all seems, it didn't prove to be susceptible to battle damage at all.

The giant powerplant caused other design "challenges," including providing clearance for the large propeller. To avoid mounting the landing gear in the wing tips to provide prop clearance, Kartveli came up with an innovative way of having the gear legs compress nine inches while coming up into the wings. Even so, the airplane's wide stance is one of the things that made it a pilot's favorite. It was said that a pilot could fill out his paperwork on final approach because the airplane could land itself.

The superwide landing gear is one of the items that make the old Jug one of the better airplanes to model in almost any scale; the larger the better. With the relatively long tail and wide gear, it is stable in takeoff and landing. In this way, it makes for the ideal first time scale taildragger for any modelers.

The Jug came into its own in thin air above 25,000 feet. Its relatively long wings and turbo power made it a real challenge for the smaller Messerschmitts and Zeros. Although it really couldn't engage in the classic, eyeballs-out butt-mashing dogfight, it could come ripping through a formation like a white-hot anvil and be gone before the enemy could hammer their throttles forward. That long wing is another feature so loved by modelers. With 38 channels of radio on board, including one to work the relief tube and another to blow the pilot's nose, the wing area works to give the modeler an airplane that carries the weight with ease.

The real airplane carried it's weight easily, although at low altitudes its best combat maneuver was to shoot and dive. And although the weight was a hindrance, it meant life-saving, built-like-a-tank reliability that no

Razorback Jug with "sponsorship" name of war effort supporters. Our editor's dad, Tony (in cockpit), strapped on a goodly number of P-47s.

Last of the series, the "N" had significantly increased range. Note extended span with squared-off tips.

other fighter could match.

In Robert S. Johnson's book *Thunderbolt,* Johnson recounts what it was like to be on the wrong end of an FW's cannons. The second-highest Jug ace with 28 kills, Johnson was caught trying to bring a wounded Jug home and couldn't use his experience and skills to maneuver. The airplane was so shot-up by ground fire that it was lucky to be flying...just the kind of thing the Luftwaffe loved to find...a Focke-Wulf did. It slid in behind Johnson and began firing round after round of 20mm and 7.92mm cannon and machine gun ammo into the plane. Flying straight and level, all Johnson could do was crouch down behind the armor plate and cross his fingers. Several times the German stopped hammering him long enough to come up alongside and marvel at the damage inflicted and the fact that the airplane still flew. Eventually, the German ran out of ammo, pulled up, saluted and went home to tell his fellow pilots about the amazing amount of punishment a P-47 could take.

Like all WWII aircraft, the Jug went through many phases during the hectic three years it was in combat. The most common model was the "D", although it was two sub-variants of the "D" that were usually thought to be two different airplanes; the razorback and the bubble-top. All fighters had an extra set of numbers after their usual identification that denoted in which production batch they belonged. For instance, a P-47D-20 was in the 20th production batch. Another suffix stated where it was built for (CU for Curtiss, RE Republic, etc.). All "D" models prior to the P-47D-22 were razorbacks, meaning the fuselage flaired up into the cockpit. However, it was found in combat that the 20-degree

(Continued on page 99)

The first of the breed, the XP-47 with spin recovery chute on vertical fin. The hinged door on the left-hand side gave way to a sliding canopy.

...answering the question, "Are sailplanes adverse-weather aircraft?"

by JOHN DVORAK

F3B GLIDER WORLD CHAMPIONSHIPS

HAVE YOU EVER flown in the rain? Some of the world's best pilots did, at least in drizzle! Were there any thermals? Does water affect speed runs? How will planes, transmitters, and winches fare? These were some of the problems the teams from twenty-four nations faced for more than a week. It rained part of every day during the practice days and during the contest.

Austria took top honors, Britain second place and Germany third place. Germany's Reingard Liese placed first, flying his Epsilon that he and Martin Schlott designed and built. Peter Hoffman from Austria placed second, flying his own design, the Target. Italy's Samuele Villani flew his original Polish sailplane to a third place victory. The Italian team placed sixth and the United States followed in seventh. For the first three rounds, Peter Abell from Australia had the highest score, while Liese (the winner) was in 18th position. Villani illustrates the roller coaster ride many pilots experienced throughout the contest. He went from 13th place in round one to first place in round two, then sixth, tenth, fifth, and to second place in round six. Steve Work, U.S.A., flew one of the fastest speed runs in the contest. Only two other pilots flew as fast, within the 18-second range. Most speed runs were 20 seconds and longer due to the heavy, moisture-laden air.

Reinhard Liese, Germany, First Place Trophy.

Most planes were made of fiberglass, including the fuselage, wings, and tail surfaces. Construction ranged from hollow, molded wings to foam cores with sandwich glass coverings. Many spars were made of carbon fiber. Former F3B winner, Rolf Decker (Germany), constructed his plane with a one-piece hollow, molded wing, while teammate Martin Schlott designed a hollow wing with a flat center section and outer panels that plugged in at 3.5 degrees dihedral. The nose section of many planes slid off as a one-piece sheath to expose the

Reinhard Liese (29), first-place winner and Martin Schllott (30) holding Epsilon.

Gert Schroter, team manager, launches Rolf Deckers' plane.

Rudolph Binkert and Hansrudolph Wagli, Switzerland, Quasar II.

Pilots flew right up to the last hour so they could have a throw-out round.

receiver and battery.

The German team attained the highest launches with their winches. The winch lines had a tension-sensing device that provided for differing power requirements during launch, which included high-wind conditions. Several other nations also had similar line-sensing devices. Few weak links were broken. All teams brought in their own batteries. Some of their winches and batteries had unique wheel systems to make them mobile. Wheels were either permanently attached or were detachable.

A sailplane airport near Osnabruck, West Germany, provided the flying field, two hangars, tent city for the teams, camping facilities, and parking. The flying field was reasonably level for the winch lines, but a few puddles did develop during the rain storms. An army tent was set up for each nation to house the teams and their equipment. Some countries put up their own tents for additional space. Dr. Helmut Quabeck, famous for his airfoil designs, ran the contest from the airport mobile control tower. He used a PA system to instruct the teams on when to go to the ready box and when pilots should launch their planes. The airport had two hangars: one was used to house the contest headquarters office, daily newspaper office, and the dining hall; the other housed the Graupner and Simprop Company booths, a souvenir booth, and a battery-charging facility. The Graupner Company provided model building classes for the children of the teams' pilots. The kids built forty model sailplanes and 3,600 balse chuck gliders.

Pilots flew right up to the last hour so they could have a throw-out round.

The closing ceremony was held in a sailplane hangar due to the threat of

German Winch. Wolfgang Siebert reels in winch line.

second place British Team. David Worrall, Mike Proctor, Nick Wright, Stephen Hailey.

Graupner model-building class for children of team members.

First place Austrian Team. Carl Wasner, Peter Hoffmann, Carl Wasner, Jr., Gunther, Aichholzer.

Standings Individuals
Top 20 out of 69 pilots

PILOT	NATION	PLANE
1. Reinhard Liese	West Germany	Epsilon
2. Peter Hoffmann	Austria	Target
3. Samuele Villani	Italy	Polish
4. Stephen Haley	Great Britain	Merlin
5. Rainer Ammann	Switzerland	Tarantula
6. Nic Wright	Great Britain	Electra C2
7. Joris Holt	Netherlands	Impils
8. Karl Wasner	Austria	Quasar 3
9. David Worrall	Great Britain	D-Plus
10. Gunther Aichholzer	Austria	Albatros
11. Bruno Sieber	Switzerland	SB-16
12. Peter Abell	Australia	LB4
13. Rudolf Binkert	Switzerland	Quasar II
14. Jeroen Smits	Netherlands	Alpuls
15. Rolf Decker	West Germany	no name
16. Martin Schlott	West Germany	Epsilon
17. Martial Legou	France	Sitelle
18. Stephen Work	United States	Comet
19. Frances Casaux	France	Pegase II
20. Richard Spicer	United States	Synergy

Standings Nations

1. Austria	13. Australia
2. Great Britain	14. Poland
3. West Germany	15. Japan
4. Switzerland	16. Israel
5. Netherlands	17. Denmark
6. Italy	18. East Germany
7. United States	19. Norway
8. Hungary	20. Argentina
9. France	21. Finland
10. Belgium	22. Spain
11. Czechoslovakia	23. New Zealand
12. Sweden	24. Canada

rain. Reinhard Liese held up his huge trophy and the sun finally came out.

The awards banquet was held that evening in a hotel in Osnabruck and the two top teams from Austria and Great Britain received their trophies.

As we left Osnabruck for home it started to rain... ■

ENGINE REVIEW

(Continued from page 49)

ful information on installation, operation and care of the engine and ends with the words: *"Call us if you have any problems. We want to know. Our reputation depends on you, so we want to make sure that your engine gives the expected performance."*

The cost of parts and service on Lasers is very modest. In fact, the manufacturer has stated that they have never charged more than £25 (just over $40 at current exchange rates) for a repair. This would buy you no more than a bare cylinder-head or crankshaft with some other makes.

These moderate repair costs help to outweigh the extra expense of having to ship the engine across the Atlantic if you want the manufacturer to service it for you. Here it is also worth mentioning that airmail shipment between the U.K. and U.S. takes only a few days and is not much more expensive than surface mail. When you buy a Laser, airmail postage and insurance is included in the price which is the same for both British and overseas purchasers.

It appears that most customers find these arrangements quite satisfactory, since Laser engines are now in use in some thirty different countries around the world.

The first Laser engine to be marketed was the 61 model in 1983. It immediately established itself as the most powerful 10cc four-stroke engine on the world market. The 75 model dealt with here was developed from the 61, but with the emphasis less on high output at high rpm, than on increased torque to enable it to drive larger props. This makes the 75 eminently suitable for scale models where the improved static thrust, obtainable with a large diameter prop, is most desirable as a means of achieving quick acceleration and a clean take-off.

The 75 has, in fact, become the most popular engine in the six-model Laser range which now includes two more single-cylinder units, a 45 and a 90; plus two vee-twins, the 120 and 150.

As we have already said, Lasers are essentially "bar-stock" motors. That is to say, those parts which, in other engines, are, almost invariably, produced as castings, such as crankcases and cylinder-heads, are, instead, machined from solid aluminum alloy material. The Laser factory has, from the beginning, used sophisticated modern computer-controlled machinery for this work and,

(Continued on page 83)

ENGINE REVIEW

(Continued from page 78)

to meet expanding demand, it is intended to continue with this method of production by installing more CNC machines, rather than to follow normal volume production techniques employing pressure castings.

Appearance-wise, the result is an engine that has very clean-cut angular lines. Let's have a look at the essential parts of the Laser 75.

CRANKCASE. The crankcase is lengthened to include the timing case at the rear. It does not embody the cylinder casing or front housing. There is a wall dividing the timing case from the crank chamber and this contains two 5/32 in. i.d. bronze bushes to support the front ends of the two side-by-side spur-gear driven camshafts. It also contains an 8x22 mm 7-ball steel-caged bearing through which the timing shaft is inserted. The upper part of the case contains two cam follower guides. Beam mounting lugs run the full length of the crankcase (2.2 in.) to provide a firm and accurately aligned installation in the airframe.

FRONT END ASSEMBLY. The hefty one-piece crankshaft has a 15 mm diameter main journal, an 8 mm diameter front journal and a 7 mm diameter crankpin. The crankweb is 10 mm thick and is cut away each side of the crankpin for counterbalancing. The shaft terminates in a standard 5/16-24 UNF thread for the Nyloc type prop nut. The machined aluminum prop driver is mounted on a steel split taper collet.

Crankshaft bearings consist of a 15x32 mm 9-ball steel-caged bearing at the rear and an 8x22 mm 7-ball steel-caged shielded bearing at the front, both of which are fully contained in a sturdy front housing that is tied to the crankcase with four hexagon socket cap screws.

CYLINDER & PISTON ASSEMBLY. The cylinder consists of a separate finned aluminum jacket, into which is inserted a thin walled (1.2 mm) steel liner, axially located by a flange at the top. The lower part of the liner is inserted into the crankcase and the whole cylinder assembly, including the cylinder-head, is tied to the case with five long socket-head cap screws.

The Laser piston is unique among current engines. Because a four-stroke engine piston—unlike that of a two-stroke engine—does not have to perform the additional duty of opening and closing ports in the cylinder wall, it needs only to have sufficient skirt length to guide it in the cylinder bore. Therefore, in the interests of reduced frictional losses and a minimum reciprocating weight, the piston skirt can be shortened and/or cut away fore and aft (as in a slipper type piston) leaving intact only sufficient skirt to align the piston in the bore and provide adequate resistance to normal side-thrust caused by conrod angularity.

As an alternative to a slipper piston, an "hourglass" pattern can be used, in which only the ring belt at the top and a narrow band at the bottom of the skirt remain in contact with the cylinder wall. It is a piston of this latter type that is used by the Laser.

The Laser piston has a total height of 17.8 mm. Of this, only the 4.2 mm deep upper land, carrying the single compression ring, plus a 3.3 mm deep bottom land, remain to make contact with the 1.04 in. cylinder bore. At the wristpin location, piston diameter is reduced to 0.70 in. The wristpin itself, however, is full-floating and full length and is contained by Teflon type plug-in pads. It is tubular, with an o.d. of 7/32 in. Complete with compression-ring and wristpin, the piston weighs 13.7 grams.

The connecting-rod is machined from high duty alloy with a tapered circular-section shank and a bronze bush at the lower end. It is fairly short at 1.48 in. (1.69 x stroke) between centers.

CAMSHAFTS & TIMING GEARS. As previously noted, the timing shaft is inserted through a ball-bearing in the wall between the crank chamber and timing case. Of hardened steel, it incorporates a 1-inch diameter drive disc at the front and a long 12-tooth pinion at the rear. The drive disc is slotted, to pick up the drive from the extended crankpin, and the rear end of the timing shaft is reduced to 5/32 in. o.d. where it is supported in a bronze bush in the center of the timing case backplate. The backplate also contains two more 5/32 in. i.d. bushes to support the rear ends of the camshafts.

The camshafts, which are also of hardened steel, have cam profiles which, in conjunction with mushroom type cam followers, provide rapid opening and closing of the valves and thereby extend the effective opening periods. According

(Continued on page 86)

ENGINE REVIEW

(Continued from page 83)

to our measurements (valve clearances having been set at the practical minimum), the valve timing of the test engine was as follows: inlet valve opens 40 degrees BTDC, closes 64 degrees ABDC; exhaust valve opens 87 degrees BBDC, closes 26 degrees ATDC. This indicates an inlet period of 284 degrees but a slightly longer exhaust period of 293 degrees, with an overlap period of 66 degrees.

CYLINDER HEAD. The Laser head features a deep wedge shaped combustion chamber in which the parallel side-by-side valves are inclined at 30 degrees—the same angle as the roof of the combustion chamber. The glowplug is at the front, angled down at 30 degrees to the horizontal into the deepest part of the combustion chamber. This places the plug diametrically opposite to the "thin" side of the wedge where it meets a large segment-shaped squish area to the rear of the chamber.

This is a theoretically very efficient design. It provides a short flame path from the glowplug to the rear of the chamber where squish turbulence minimizes the risk of detonation of the end-gas. The angled valve throats also have the advantage of presenting a less abrupt change of direction for gases through the 8 mm bore inlet and exhaust ports.

VALVES & VALVE TRAIN. The Laser follows full size practice in having separate valve guides and seats (but still made of bronze) instead of the combined cup-type bronze components usually found in current production model four-strokes. The valves have 9.2 mm diameter heads and 3 mm diameter stems and are secured to the valve spring caps with split cotters.

The rocker arms are machined from high duty aluminum allow and are fitted with steel pads where they bear against the valve stems. They are also equipped with the usual screw adjusters for setting valve clearances. The rockers are partially recessed into the head, where they are mounted on a 3/16 in. dia. hardened steel rocker shaft and are protected by a shallow cover. The rocker ratio checked out at 1.4 to one, converting the cam lifts to a valve lift of 2.3 mm, less an allowance for valve lash. The pushrods, conveying movement from the cam followers to the rocker arms, have the usual hardened domed ends and are enclosed in chromed tubular covers.

CARBURETOR & INLET PIPE. The standard carburetor fitted to the Laser 75 is a Super-Tigre product, i.e. a "Mag" automatic mixture control type with 7.5 mm venturi and an effective throat area of 25 sq. mm. The carb plugs into a straight 7.0 mm bore inlet pipe which, in turn, plugs directly into the cylinder head inlet pipe where it is secured by two headless set-screws. Both connections are sealed with O-rings to prevent air leaks.

MUFFLER. A small drum-shaped muffler is supplied with the Laser 75 and plugs directly into the cylinder head where it, too, is secured with two headless set-screws. The muffler is an integral part of the exhaust pipe and the user is thereby discouraged from running the engine without a muffler. The complete assembly can be rotated in the head, enabling the angled 7 mm i.d. muffler outlet pipe to be adjusted to the position best suited to any individual installation.

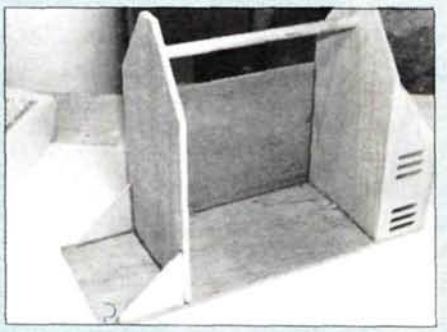
(Continued on page 90)

Goldberg Supertote

by STAFF

A rapidly assembled field box for all your support equipment

Goldberg's Supertote components right out of the box are ready to assemble. Right, after finishing an assembly, with all field equipment.



Left, first stages of assembly; pre-cut ply parts fit well.

Opposite end of Supertote houses power panel and twelve volt battery. Note air cooling slots.

ENGINE REVIEW

(Continued from page 86)

PERFORMANCE

All our tests on the Laser 75 were carried out using a straight "no nitro" fuel mixture consisting of 80 percent methanol and 20 percent castor-oil. This was in accordance with designer Neil Tidey's recommendations. As he correctly points out, although the addition of nitromethane increases power and also improves flexibility, its use increases the risk of bottom end corrosion due to the condensation of blowby gases in the crankcase. Had we substituted the 5-10 percent nitro fuel customarily used in previous M.A.N. tests of four-cycle engines, the Laser would probably have delivered at least 5-6 percent more power but, as the performance curves indicate, the output determined on straight fuel was, in any case, above average for a four-cycle engine of this size fitted with a muffler.

The maximum torque recorded was 112 oz-in. (equal to a brake mean effective pressure of 118 lb/sq in.) at 8,000 rpm. The torque curve declined steadily as load was reduced so that, when plotted, the power curve indicated a peak output of 1.08 bhp at just over 11,000 rpm.

Typical prop speeds obtained included 7,300 on a 14x8 Airflow beech, 8,050 on a 16x4 Top Flite maple, 8,750 on a 14x6 Master glassfiber/nylon, 9,000 on a 15x4 Airflow beech, 9,150 on a 14x6 Top Flite maple, 9,800 on an MK glassfiber/nylon, 10,900 on a 12x6 Zinger maple and 11,400 on an 11x7½ Zinger maple. The latter is, of course, a bit too small for the Laser since it will allow the engine to speed up well beyond the peak of the power curve in flight: it would be better to choose a prop that will hold static rpm readings down to a maximum of around 10,500 rpm.

The best prop size is, of course, a function of model type, as well as engine characteristics, and could range from a maximum diameter of 16 inches with a 4 to 5 inch pitch for large models having low wing loadings to, say, a 12x8 for a small, fast model. In between these two extremes, average sized models of medium wing loading will probably respond well to 13x6 or 14x6 props.

The Laser 75 was easy to start and its general handling and running were good. The engine was given approximately two hours break-in time before tests were undertaken. It lost power on warming up, initially, but gradually improved as more break-in time was accumulated.

It is claimed that, despite its high compression ratio, the Laser is not prone to detonation, thanks to the combustion chamber shape previously described. Detonation can, of course, result in the prop being kicked loose or even thrown off, but we have to report that this

phenomenon was not detected at any time in the course of our tests of the Laser. Nevertheless, it is always a good idea to check the prop nut for tightness before starting the engine, even though, in the case of the Laser, a Nyloc type nut is employed which, even if it should loosen, is unlikely to come off.

Our test model Laser 75 was supplied with a standard Super-Tigre long-reach glowplug and this obviously suited the engine very well. A second plug of the same type was used as a check during the tests, to make sure that no loss of performance occured through deterioration of the plug element.

The Laser responded well to the Super-Tigre Mag type carburetor and we experienced safe idling down to around 2,200 rpm on a 14x6 prop, with immediate response to the throttle and steady intermediate speed operation.

Any reader who is interested in acquiring a Laser engine can obtain full details and prices from the manufacturer at the address shown in the data table at the beginning of this article. Incidentally, the demand for Laser engines is such that every motor is sold before it is built. Be prepared, therefore, to have to wait a short while from the date of placing an order. Don't write to us on this! Please check with the factory. ■

AEROSTAR 40

(Continued from page 28)

even the packaging are all also first-class. Let's take a closer look.

By far, the most innovative feature of the packaging is the use of sealed poly bags that contain all of the parts for a particular assembly step—an approach that has been used for some time in helicopter kits. Each bag is numbered and the instructions tell the builder when to open the next bag in the building sequence. Both the wood parts and the hardware are bagged; the only exceptions are the two large, light ply sheets with the die-cut fuselage sides which are placed in the bottom of the box to keep them flat.

Through the clear bags, one can see that the balsa is of good quality and of straight grain. He will also find that the densities are well chosen for their respective purposes. The tail components are machine-cut from the ¼-inch-square spruce. The ribs are machine-cut 1/16-inch balsa and pinned together in a stack. Just about all of the fuselage parts are die-cut from Midwest Micro- I found that they could easily pushed out of their sheets and only a few strokes with a sanding block to square required be spruce. The ribs are machine-cut 1/16-inch balsa and pinned together in a stack. Just about all of the fuselage parts are die-cut from up the edges. This step is shown in the instructions.

A reasonable selection of hardware is provided, including pushrod ends, landing gear, nosewheel bracket, nylon engine mount and an assortment of screws. The ¼-inch-ply firewall is pre-drilled with all holes necessary for the mount, bracket, pushrods and fuel lines. The decal sheet is in a class by itself; it includes self-adhesive windows with the simulated appearance of a cabin interior.

Three rolled plan sheets are provided. One shows both wings, another shows the fuselage side and top views, including the tails, and the third illustrates the optional installation of a four-stroke engine. Two alternate radio installations are also shown. These plans are really well done and incorporate cutaway views, phantom lines and cross-section views for clarification of the structural elements.

The instruction manual is profusely illustrated with exploded views and isometric drawings. It describes the assembly process in a logical sequence of many small and understandable steps. The instructions also thoroughly explain finishing, control linkage hookup, balancing and flying for a new modeler. The book is oustanding.

(Continued on page 94)

AEROSTAR 40

(Continued from page 91)

Almost all construction steps reference the use of cyanoacrylate adhesives. I used PIC Stick brand by Penn International Chemicals* in all three formulas: quick cure, medium cure and slow cure. For making glue fillets I applied the slow cure and sprayed on PIC Pronto accelerator. I also should mention that their Skin Shield protective hand cream really does keep your fingers from getting glued to the airplane.

The instructions take you through the tail, fuselage and wing in that order. The stabilizer has two main parts plus tips which are installed with the grain running chordwise to prevent warping. The fin has three main parts plus an alignment tab on the bottom which will fit into a matching slot on the fuselage top for perfect alignment.

The die-cut light-ply fuselage sides, top and bottom parts and the formers have locating tabs and slots for accurate alignment. The assembly process requires fitting most of the parts into position prior to applying any glue. At this stage the pieces are only being held together with tape. Then, thin cyanoacrylate glue is applied to all of the joints and seams to make a permanent bond. For extra strength I applied a second coat of thick cyanoacrylate and accelerator to form glue fillets. Installation of the firewall is next. All of the required holes are pre-drilled, and the builder only has to trial-fit the motor mount and nosegear bearing and then seat the blind nuts with a little cyanoacrylate glue for security.

I glued the firewall in place with a 4½-minute PIC Poxy (also from Penn). This epoxy was also used to glue the main landing gear block in place. The block is keyed into a recessed cavity in the fuselage bottom and a separate cover plate is used to retain the wire gear legs. This is perhaps a bit more work than is warranted on a trainer, but it results in a very secure installation with a clean exterior appearance. During the final assembly stages the tail surfaces and cowl blocks were installed onto the fuselage.

The D-tube wing construction is quite straightforward. However, considering the modern simplicty of the fuselage, I was a bit surprised that the wing construction was so conventional. My only criticism of the Aero-Star kit stems from Midwest's choice of 1/16-inch balsa for the ribs and all of the sheeting. I think that a 1/16-inch sheet is a bit delicate for beginners to work with. I would have preferred 3/32-inch, which is more robust and can take a little more sanding without getting too thin in spots. Admittedly, the wood quality was very good, the parts fit was excellent, and the finished wing quite strong; but a first-time builder might break a few pieces if he is not careful during construction.

The wing uses a flat-bottomed airfoil so it can be built directly over the plans on a building board. The first step is to pin and glue all of the bottom sheeting and capstrips in place. This is followed by gluing the lower main spar and all of the ribs into position. Next, the top spar and the leading and trailing edges are installed as well as the pre-cut shear webs. Note that the full-width shear webs are packaged together, while the shorter ones are loose. After this, the top sheeting and capstrips are added and the wingtip parts are glued into position.

At this time the builder must decide whether to install operating ailerons or to glue on the tapered trailing edge stock permanently. The ailerons are of the full-span strip variety and are actuated by torque rods. The rods are captured by a torque-rod box which is milled into the

hardwood center section trailing-edge pieces. Typically a torque rod rotates in a plastic sleeve which is glued into the trailing edge. Midwest, however, has taken the approach of installing the bare wire into a slightly oversized rectangular channel. The builder must oil or grease the wire and be careful that excess glue does not bind the rod from rotating after assembly. Even so, this method produces somewhat more play in the linkage than is desirable, but it has not proven to be a problem in flight.

The completed wing panels are then epoxied together with a plywood dihedral brace that fits between the upper and lower spars. Fiberglass tape is also wrapped around the center section and adhered with cyanoacrylate glue. The fairing, which mates the wing leading edge to the fuselage top, is made from several pieces of triangle stock. This proved to be a lot easier than the old fashioned method of carving a block to match the airfoil contour.

I decided to finish my Aero-Star with the new Carl Goldberg Models* Ultracote plastic covering material. I have been impressed by the demonstrations at trade shows and had already heard favorable comment from fellow modelers.

Ultracrote streches well around curves and the wrinkles really disappear when shrunk with a hot iron or heat gun. The exterior surface of the material has more of a luster than a super-high gloss. It is possibly a bit more scale looking but it's a matter of personal taste.

My Aero-Star is powered by a Webra Silverline .40 imported by Circus Hobbies*. This is a nice, loop-scavenged (intake porting) sport engine, but it is manufactured with the same West German craftmanship that has made Webra high-performance engines so popular. It has moderate power, and very easy handling characteristics that sport modelers will appreciate. It is a good choice for this airplane and can be used again when the pilot moves to a more advanced model.

For trainer models I usually install one of my simpler radios—this time it's an old Kraft* seven-channel system with four KPS-14 servos. As shown on the plans, I used a plastic servo tray in the fuselage and made up the elevator and rudder pushrods from the square spruce stock and wire ends that were provided. The No. 1x72 screws provided for horn installation did not bite securely in the backing plate so I replaced them with No. 2x56 screws. I was able to use the solid-wire pushrod for nose-gear steering, but I had to substitute braided cable for the throttle in order to eliminate binding. With the airborne components located as shown, the model balanced at the correct center of gravity.

FLYING. As I said earlier, this is an excellent trainer. For one thing, it has very good hands-off stability. This means that you can easily get it straight and level and it will stay that way by itself. Also it has respectable self-righting capabilites. This means that when you get it all sideways and crossways, the airplane will tend to come back to straight and level flight by itself by throttling back and releasing the sticks to neutral. Although this characteristic is not as strong as in some three-channel aircraft with lots of dihedral, it does provide adequate time for a beginner to take corrective action. The Aero-Star always reacts gently but positively to the controls.

The model has a pretty wide speed range, and really great low-speed handling characteristics. What little stall I could induce was simply a straight mush rather than a clean break, and it never dropped a wingtip. All controls were effective, even when the airplane was in a nose-high attitude. Landings and touch-and-go's were a cinch. At high speed the Aero-Star can do enough aerobatics to keep an advanced student interested. Loops, rolls and inverted flight were accomplished, but I couldn't get it to spin.

This airplane's principal duty is basic training, and it does that very well. It is easy to build and the result is a model that the student can be proud to bring out to the field. It's nice that an established company like Midwest would be so responsive to the needs of the beginner.

**The following are the addresses of the companies mentioned in this article:*

Midwest Products Co., 400 S. Indiana St., Hobart, IN 46342.

Penn International Chemicals, 943 Stierlin Rd., Mountain View, CA 94043.

Carl Goldberg Models, 4732 W. Chicago Ave., Chicago, IL 60651.

Cirus Hobbies, 3132 Highland Dr., Las Vegas, NV 89109.

Kraft Midwest, 117 E. Main St., Upper Lvl, Northville, MI 48127. ■

ROYAL CESSNA

(Continued from page 56)

threads in the plywood wing plate with epoxy, re-drill and re-tap. With either method, enlarge the holes in the wing slightly to avoid having to screw the bolts through.

By now you might be asking, "Why didn't he eliminate the blind nuts and use those holes?" Good question. It's because I epoxied the blind nuts and the plate in, and then decided to use different bolts. You can decide for yourself.

Landing gear installation is next. The only change I made was to use slightly larger screws to attach the main gear to the fuselage. I slotted the wheel pants to clear the inside collar and glued the sponge wheels to the rims to prevent separation. The one-piece pants are easy to install and add to the Cessna's great scale-like looks.

Next is the engine and fuel-tank installation. I chose the Royal .40 ABC, which fit perfectly; it will provide ample power for trainer and sport flying. It's easier to install the tank first (don't forget the neoprene ring between the firewall and tank), and then the engine. Assemble the 4-piece cowl (including upper and lower doublers) with thin cyanoacrylate glue, then add the side decals. To assure clean joints on all the plastic pieces don't apply too much glue—the excess is almost impossible to remove without damaging the plastic (debonders also damge the plastic). I use the cyanoacrylate reducing tubes to make thin but adequate applications, with much success. I have been told that Royal has now gone to a 1-piece blow-molded cowl in their newer kits so the aforementioned may not apply to you.

Plastic upper and lower fairings help make the installation of the tail parts quite simple. Epoxy the plywood brace at the rear of the fuse, then trial-fit the fairing along with the horizontal vertical stab. Before permanent assembly reinstall the wing and check for correct alignment.

Radio installation drawings show all hookups at servo and control-horn points. The CG is conveniently shown on the fuse, and both servo trays have tongue-and-groove installation that can't be put on the wrong way. The rudder pushrod has a one-wire hookup, while the elevator has a two-wire hookup to the control surfaces. In my opinion, the elevator should have a one-wire setup also, but finishing the wires through the pushrod exits will help you appreciate the lower fairing.

Control surface throw settings are 3/16-inch for aileron, 5/16-inch for elevator and 3/16-inch for rudder.

Remember to install the brass tubes and plastic plates between the control horns as well as the safety-vinyl tubing over the clevises, and familiarize yourself with the pre-flight instructions and safety tips.

FLYING. The Royal Cessna 40 fully supports the adage that "it flies like a Cessna!" Where I come from that means, docile, reasonably maneuverable, mildly aerobatic and gentle on landing. This version of the Cessna does all of this with all the prowess of its full-scale relative. I found that the Royal .40 engine selected for this review wasn't quite heavy enough to offset the stability, yielding long tail moment so I added 2 ounces to the nose in the form of a Prather spinner weight. This amount may increase somewhat, if you add your weight just behind the firewall near the fuel tank. The CG location is imprinted on the fuselage sides for you. Just make sure you're in the proper range.

The engine started on the second hand-flip, in spite of my concern about the characteristic ABC stiffness at the top of

the piston stroke. It idled down real well, surprising for an out-of-the-box engine!

Aiming the Cessna down the runway, I added power and it accelerated smartly. The nose-wheel steering was a bit sensitive, causing the takeoff track to be less than arrow-straight, but it became airborne in about 100 feet. The only trim required was a bit of nose-down...no aileron or rudder!

I found the Cessna to be trainer-like in flying qualities and very gentle on the landing. Approaches that are a little high and can be held off by a bit of "cross controls" to introduce a sideslip. The airplane is clean and doesn't slow down rapidly but has a very comfortable wing loading which reduces some of the "bullet" effect.

A number of things became evident after repeated flying of the Cesna. It will perform most intermediate aerobatics; the stall turns are particularly nice and are easily done with that big rudder. Although the Cessna *will* rocket around in a very unscale-like manner with the Royal .40 wide open, it really looks much better at about 60% power.

Unless you always take off and land from a prepared surface, don't bother installing the wheel pants. Even on close-cut grass, they're draggy and won't stay aligned for long. It's a shame, too, because they look nice. The Royal engine seems to get better as it gets broken in. That characteristic TDC "bind" is much less pronounced now and the idle keeps getting smoother.

I think this offering from Royal will find greater favor with the sport-trainer crowd and might be a great candidate for a club trainer.

**The following is the address of the company mentioned in this article:*

Royal Products Corp., 790 W. Tenn. Ave., Denver, CO 80217. ■

P-47

(Continued from page 70)

blindspot to the rear was too much, and the D-25 started the bubble canopy series. In total, over 12,000 "D" models in both variants were produced.

The final variation was a real Hoss! The "N" was designed specifically for the long-range escort duties necessitated by the Pacific style of playing war. Designed from the beginning to hide as much fuel internally as possible, the "N" could carry as much as 1,266 gallons with drop tanks, which gave it a range of over 2,350 miles. That's a long time to stay strapped in a fighter cockpit!

The "N"'s most identifiable characteristics were its blunt-nosed dorsal fin and squared-off wing tips.

When painting a model, the Jug is a dream come true because, like most warbirds, the Jug was painted just about every color except pink, and even that may have been done. However, one paint detail has to be discussed, the tailstripes. Often, the tailstripes are thought to be part of the famous "invasion stripes" that were painted on all allied aircraft during the Normandy invasion to help in indentification. This is not the case. When the Jug first went into combat, the only other round-engined fighter in the ETO was the FW-190. To keep trigger-happy bombers and anti-aircraft crews from punching holes in friendlies, stripes were painted on the cowl and tail surfaces. It dosen't speak well for WWII aircraft identification skills if it took tail stripes for a gunner to tell the sweet-potato shape of the Jug from the rapier form of the FW.

There are some really amazing facts about Jugs that won't show in a model, but make for good conversation at the flying field. For instance, P-47s were used in level bombing raids just like bombers, and when loaded to the gills with bombs, were carrying nearly half the bomb load of a B-17. In total, they dropped 132,000 tons of bombs and fired 135 million rounds of .50 caliber and took a shade under two million flying hours to do it. For every Jug lost in combat, they knocked down 4.6 Nazis. Two-thirds of all Jugs produced went into combat theaters and 54 percent were lost to operational and combat causes, a percentage that is almost identical to all other fighters. There were nearly 16,000 built, but less than half a dozen are still flying.

For those seeking a live Jug photograph or just smell, your best bets are the Kalamazoo Air Zoo in guess where; theirs is in Gabreski's colors. Planes of Fame in Chino, CA, sometimes has Bob Pond's (formerly Ray Stratsman's) Razorback on display, along with their own "D" bubble-top. Champlins Fighter Museum in Mesa, AZ, has a Razorback on display and the CAF has at least one, but it's unknown as to whether it's on display or not. The Air Force Museum in Dayton also has one.

The Jug makes a stable, easy-to-fly model that's easy to detail. But no matter what the scale, it will still be bigger than any of its friends. A word of caution: don't build a quarter-scale Jug if you drive a Volkswagon. ■

another month. Sorry about that. Next month we will cover the set-up for the anti-torque system on most of today's radios and talk about ground-effect in continuance of our series on trimming. Until next month, keep the spinning side up.

**The following are the addresses of the manufacturers mentioned in this article:*

Miniature Aircraft USA, 2324 N. Orange Blossom Trail, Orlando, FL 32804.

Schlutor Helicoptors, 180 Township Line Road, Belle Mead, NJ 08502. ■

HELICOPTER

(Continued from page 45)

cause the helicopter to react unpredictably. Adjust the tail rotor control trim lever on your transmitter to correct the drift and repeat the flight test until the helicopter either maintains momentary hands-off heading, or until the nose appears to remain in the same heading for the gentle rise and descent.

If the tail rotor system is properly installed and adjusted, the task of basic trimming should be fairly simple. If you are having problems, be sure to recheck all of your work, and repeat the flight tests until the desired results are obtained. Don't be surprised if the trim changes from day to day, as weather conditions change, and trims get moved, etc.

OOPS! In the September article, I committed a slight of the keyboard, or should I say that I made a mistake. At any rate, I received a letter from Jim Katz of Malden, MA who discovered that it is possible to reverse the direction of the gyro by switching the servo output from one side to the other. Jim wrote, "If the gyro wants to move the servo clockwise when the tail of the model is swung to the left and this is backwards for your particular model... and if the push rod is positioned on the servo wheel so that clockwise movement will "pull" the push rod, and you need it to push the push rod...then it makes sense to move the push rod to the other side of the servo wheel. The same clockwise movement will push the push rod and give you the movement you want." This will only be an option if room exists for the push rod to operate from the other side of the servo wheel. It should make things a littler easier the next time you are setting up your gyro. Of course, you will need to have servo reversing for the tail rotor on your transmitter as the tail rotor will now be operating backwards. Thanks Jim!

In the previous issue I promised to start a manufacturer's spotlight with Rotary Wing Concepts. However, time and space has not allowed me to get to this so I will have to put it off for

TWILITER II

(Continued from page 24)

section flat on the bench and elevate the two tip sections to match the dihedral angle and install the braces, check for fit, and then glue all joints. When everything is dry, install the bottom front spar and the leading edge.

Glue the 1/8-inch sheet tips to the two tip ribs; notice that they slant up to become flush with the top of the top spars. Trim the top spars to the proper angle to fit against the tips. Use scrap spar material to build in between the bottom main spars and the tips. Sheet the center section and add the top trailing edge sheet. Sand the completed wing.

The stab and rudder are built right over the plan just as the wing. The two 1/16-inch plywood spar doublers should not be eliminated from the stab, for they add much strength in this area. When complete, join the mating surfaces and sand the outlines to match and install the 1/16-inch music wire elevator carry through.

FUSELAGE: Cut the two forward fuselage sides from fairly lightweight 3/16-inch balsa sheet, then join them and sand them to the same outline. While they are

joined, drill the holes for the wing mounting dowels.

Build the fuselage right over the plan just as the stab and rudder. Longerons and uprights are medium 3/16-inch square strips. You can build both sides at the same time, one right over the other, if you use an aliphatic resin glue. While the glue is drying, build up the two cabin bulkheads, cut out and drill the firewall.

Add the servo rails and join the two sides with the bulkheads. Bring the tail together and add the cross pieces to the top and bottom. Check alignment. Sheet the bottom of the fuselage from F2 back to F3, then epoxy the firewall in place. Since there are no plywood doublers in this area, drill two 1/16-inch holes through the sides into the firewall and pin it in place with round toothpicks and glue.

Epoxy T-nuts for the engine mount on the back of the firewall. Then, epoxy the 1/8-inch copper tube fuel and overflow lines, as well as the throttle line through the firewall. The engine mount may have to be drilled to allow for the throttle line. If so, temporarily install the engine mount and drill it first, then the firewall. Install the tank floor, bulkhead and stop, then wedge the tank in place with foam on both sides and connect it to the copper tubes with fuel tubing. Do not allow any kinks in these lines. Finish the top and bottom sheeting and sand the completed fuselage.

The original is covered with Monokote on the wings and stab, and Micafilm on the fuselage and rudder. Whatever you use, follow the manufacturer's instructions for application. The elevator hinges on the original are Monokote and in like manner, the rudder is hinged with Micafilm, but hinge the surfaces in the way you are most familiar.

Trim the covering away from the center of the stab where it contacts the fuselage as well as the top where it contacts the rudder. Epoxy the rudder to the stab and the stab to the fuselage. Trim the covering away from the pre-drilled holes and epoxy the 1/4-inch wing mounting dowels in place.

Before bolting the engine mount permanently to the firewall, it is a good idea to paint the firewall with a coat of epoxy. When the engine is mounted, attach the fuel line to the carb and the overflow line to the muffler pressure tap. Run a piece of soft iron wire through the throttle nyrod and connect it to the throttle arm. A "U"-shaped bend in the wire at the arm acts as an adjustment, as well as a strain relief for the servo.

Before installing the radio, assemble the airplane and check the balance point. Move the battery pack and servos around until it balances at the point indicated on the plans; then, install the radio to maintain this balance. Connect the elevator and rudder to the servos with pushrods made from medium 3/16-inch square balsa as shown. Make a "Z" bend in the throttle wire to engage that servo. Check to see that everything reacts properly to the transmitter controls and, after a range check, the airplane is ready to fly.

FLYING: There is no need to make a big deal out of launching; just aim it at the horizon and throw. It will almost fly out of your hand. The original was powered by a .10 and it proved to be more than enough power. In fact, I think a .049 would fly it quite well. Anyway, once in the air you will find that it handles as though it had ailerons. Turns are smooth and the response is linear to the control input, with none of the characteristic tail wagging of rudder controlled airplanes. With the balance point shown on the plans, trim for level flight at full throttle or just above idle as available at the transmitter. It has a rather wide performance envelope!

It will climb at a very high angle and, although not a sailplane, will soar in very gentle lift. Now for a surprise, rolls are almost axial, and it will do outside loops as well as fly inverted! With a 4 oz. tank it will cruise for 34 minutes!

Incidentally, during its very first flight, while friend John Gill was flying it for some pictures, the rudder pushrod failed and it spiralled in, straight down! The ground was hard and the grass sparse. The firewall was moved back about 1/4 of an inch, and a longeron was broken just in front of the stab. Repair time was less than an hour. Moral: build light and check your pushrods! ■

AERO-RACK

(Continued from page 34)

3/4x1 1/2-inch fir. Pine, fir, redwood, or any hardwood will do.

When you assemble the base frame, it is important to run (the weight-bearing rails) to the full length and attach them to the members that run parallel to the wings. This takes the weight off of the joint. Use #8 x 1 1/4-inch wood screws and 1 1/2-inch finishing nails. You may use

AERO-RACK

white glue as well, but I don't think you'll need it. One screw in the center and a nail on the top and bottom is enough.

From 1x2-inch stock, measure and cut the correct number of blocks for the support posts. Cut them 1½-inches high. (They shouldn't protrude over the top of the rail.) Refer to the detailed drawing and drill a ½-inch hole about ½-inch deep to accept the dowels. Drill a hole through the front to accept a carraige bolt (about 2½-inches long) and use wing nuts to secure them. Be sure not to go too deep with the dowels or you will block the holes for the bolts.

Cut ½-inch dowels to the desired length (12 inches to 18 inches) and secure them to the blocks with white glue. Measure off the placement of the blocks on the side rails to approximately three to four inches apart.

Locate and drill holes to mount the blocks. Remember, you do not want the blocks to protrude above the rail! Do not mount the blocks just yet!

If you are going to mount the rack by suspending it (like I did), then this is the time to cut out and attach the little widgets that will hold it in place. I used ¼-inch plywood for mine (refer to drawing). Now cut strips of foam rubber padding for the top of the side rails. The padding should be ¾- to 1-inch thick, and attached with the contact cement (rubber cement or spray adhesive). Don't staple or nail as they can damage the wings.

Now, attach the blocks with the dowels to the inside of the rails with the wing nuts on the inboard side. (This will protect your car from the bolts.) You may want to leave a space or two to allow room for a fuselage or wing-mounted landing gears. Next, cut the pipe insulation to the length of the dowels. This is available at most building supply stores. Try to find the 10-foot lengths, as they are cheaper than the short pieces. Slide them over the dowels, install in your car or van, and go flying!

This system cost me about $24, including the bolts and bungees. This is a very small price to pay when you see how well it protects your planes during transit. If you have any ideas like this, or have some thoughts on how to do it better, please let me know. We'd love to hear from you. ■

GIANT STEPS

(Continued from page 14)

the organization, whose address appears at the end of the column. Now that I have the plug for IMAA out of the way, let me admit that I have been IMAA's President for 1986-87. You can bet I believe in the organization and I solicit your participation. I'd be delighted to welcome you aboard.

It amazes me sometimes how little many of us know about simple aerodynamics. What brought the subject to mind was a recent rally I attended where a modeler was having a great deal of trouble getting his twin engined model airborne. The engines were performing well, but the airplane simply couldn't seem to get up enough speed to take off. I suggested to him that he might be the victim of density altitude; and when he asked what that was, I had trouble believing my ears.

Turns out, he had done much of his flying at sea level and flying at an altitude of 2,000 feet was new to him. That alone would have made a significant difference, but the day was quite hot and the air was very dry. This combination (high temperature and low humidity) works together to create a situation where the effective altitude is greater than the actual In this case, the 2000 feet above sea level was probably effectively another thousand feet higher. His model, normally flown at sea level, just wasn't behaving as he was used to, and he couldn't figure out what was wrong.

In such a case, the engines may not have been producing as they would have at sea level and a little needle-tweaking might have made a difference. On top of that, the low humidity made things even worse as dry, warm air is much less dense than air which is cool and humid.

What to do when you're faced with such a situation? Assuring the best possible performance from your engine is a good place to start; then once you are satisfied that the engine is delivering its best, try a few different props. Going to a coarser-pitched prop may well make all the difference. The prop which works well (and properly loads the engine) at sea level may well be replaced with a harder-working propeller at altitude. That thinner air, especially if it's also drier air, will permit the use of a larger diameter and/or coarser-pitched prop without loading the engine down too much.

Under such circumstances an engine may also run noticeably hotter than it would at sea level; but so long as it does itself no harm, this is no problem. It's a good idea to keep an eye on cylinder head temperatures at first just to assure they are not getting excessively hot. You'll find full-size airplane pilots doing the same thing under similar conditions.

When it comes to propellers, be open minded wherever you're flying. I shake my head when I see people slavishly devoted to a single size and pitch of propeller for a particular engine. Varying flying conditions (as above) can alter the needs of the engine. A different model may well require a different prop than the previous model flown with the engine. Anytime a new model is being flown, try several props on it before settling for the one which performs best. While it can be expensive to carry a wide assortment of propellers in your field box, having a representative sampling of props with you will provide some "adjustment" if and when you need it.

Trying several props on a new model will allow the selection of the one which best suits the needs of that model, and the purpose for which it is being flown. While some compromise may be required between level-flight performance and vertical capabilities, a compromise which does best overall and satisfies your needs is usually possible.

What about the airplane that turns out to be a real dog? All that time and effort put into building and finishing it and it just doesn't perform as you'd like. While you may not be able to completely revise its performance, getting it properly trimmed for flight can make a significant difference. Most clubs have such a builder who is an expert at trimming airplanes for flight. If you have such an individual in your club, enlist his help in getting a good trim on your airplane. While most of us are not able to work miracles, I have seen some real doggy airplanes made to fly quite well with some trimming alterations.

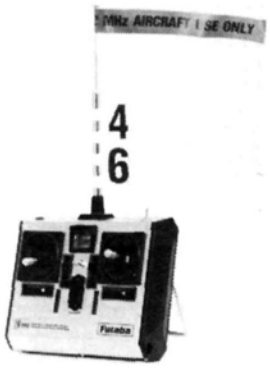
If there isn't such an individual available to you, then you'll have to become your own expert. There are a number of things you can try, and some will be obvious. If there are dramatic pitch changes as the throttle setting is changed, you need to adjust engine offset. Same thing if the model veers sharply to the right when the throttle is snapped open quickly. Depending on the installation, small shims or washers may be added to alter the thrust line slightly. (It's a good idea to provide for this adjustment during construction.)

A slight alteration of the thrust line, then a flight or two will soon tell you if you're on the right track or not. Continue with the shimming until performance begins to deteriorate, then go back one step and you'll be where you should be. Don't be too hasty in making changes, as small changes may not become obvious until you've had some stick time with the model.

Is the model properly balanced? That is, is the CG in the correct location? Keep in mind that the location shown on the plan probably leans toward making the

(Continued on page 115)

Product News



DU-BRO

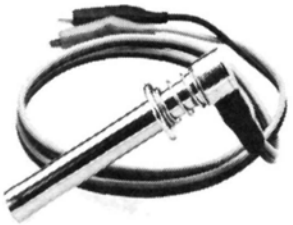
Du-Bro (480 Bonner Rd., Wauconda, IL 60084) has the numbers that you need to comply with the new 1988 AMA Frequency Regulation. Select the channel that corresponds to the frequency of your transmitter. Affix these numbers to the frequency number clip and snap it to the base of your antenna. Select the frequency flag that identifies your transmitter as Aircraft or Surface use only, and attach it to your antenna. It's quick and simple to use.

HOW-TO SERIES

Robart (310 N. 5th St., St. Charles, IL 60174) now offers a wide range of pamphlets covering every aspect of the model airplane construction process. These include helpful information on hinges, retractable landing gear, scale wheels and struts, setting up your wing with an incidence meter and much more. Available at your hobby shop.

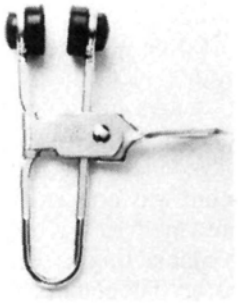
PIC EPOXY

PIC (943 Stierlin , Mountain View, CA 94043) now offers the first brushable and spreadable low-viscosity epoxy for surfacing and laminating applications. Specially formulated to provide maximum "wetting" on woven materials like fiberglass cloth, and will easily sand to a smooth finish. Excellent for use on plastic foams. Available in 4.8 and 38.4 fluid ounce sizes.



HOBBICO PLUG CLIP

The Hobbico (P.O. Box 4021, 1608 Interstate Dr., Champaign, IL 61820) Locking Glow Plug Clip is designed to lock on to either standard or four cycle glow plugs, so it won't slip off even in the toughest situations. It is extra-long to reach plugs in enclosed cowls or in roll cages on gas cars. It also uses alligator clips to connect to your power panel or glow plug battery.

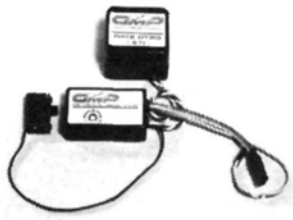


HANDY CLAMPS

It's a simple idea. Handy little clamps about four inches long that clamp down with the flip of yoru thumb. It's hard to believe that no one else thought of them sooner, you can use them to hold hundreds of things in place. Use them for holding parts of your airplane together while gluing, pinching fuel lines, or even to hold blueprints to the tble. The number of uses are endless Made of chrome-plated steel with soft rubber bushings for a firm hold without marring or scratching. From Zephyr Mfg. (201 Hindry Ave., P.O. Box 759, Inglewood, CA 90307).

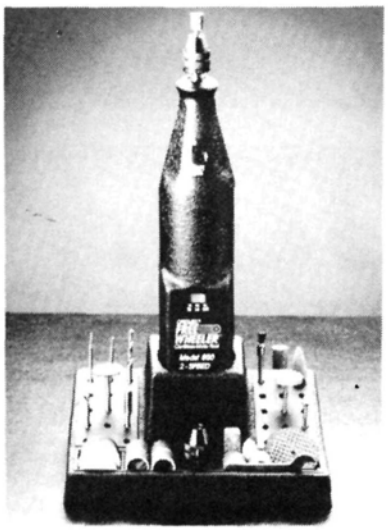
WEBRA HELI ENGINE

Circus Hobbies (3132 S. Highland Dr., Las Vegas, NV 89109) introduces the new exclusive .52 Heli and Aircraft Webra Speed engines to their complete line of Webra engines and accessories. Designed to fit most .40-size applications, these Speed .52 engines offer side exhaust, front intake, Schnuerle porting, ball-bearing-supported crankshafts, ringed pistons, and TN barrel-type carburetors.



GORHAM RATE GYRO

GMP's (23961 Craftsman Rd., Calabasa, CA 91302) new Rate Gyro is great for the beginner or expert because it automatically trims down unwanted activity in your helicopter while permitting your radio commands to be followed with less resistance. Reasonably priced, it is the most popular gyro in the U.S.



DREMEL FREEWHEELER

Dremel's (4915 21 St., Racine, WI 53406) new Freewheeler cordless Moto-Tool frees modelers to use the versatile Moto-Tool for even more hobby use. Its advanced battery technology enables it to cut the cord without sacrificing high-speed applications. It can use all the accessories available for the 120V corded Moto-Tool. The 2-speed tool uses a 6V high-torque motor powered by 5 Ni-Cd batteries.

SPACE CASE 2035

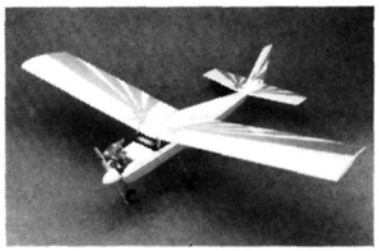
The new "HI-Tech" Space Case 2035 is designed with molded-in handle and cradles that can be cut to accept an airplane fuselage or a boat hull. Additional features include molded ends for power panel, 2 one-piece molded drawers, and folding legs. This field case is constructed of tough, moisture-proof 1/8-inch black textured ABS plastic and is approximately half the weight of wood. All materials are included for easy, no-tools assembly.

ROYAL .40 CHEROKEE

The Royal (790 W. Tenn. Ave., Denver, CO 80223) Cherokee is the latest addition to their PDQ series of Ready-To-Fly aircraft. The kit includes all necessary hardware, including wheels, fuel tank and motor mount. The kit features lightweight foam/plywood construction, pre-hinged control surfaces, an illustrated step-by-step instruction manual, and a beautiful pre-painted, high-gloss finish that is fuel-proof. The Cherokee has a wingspan of 52 inches a wing area of 468 square inches, and requires a .25-.40 2-cycle or a .40-.46 4-cycle engine.

CORONA SAILPLANE

The Corona from Robbe (180 Township Line Rd., Belle Mead, NJ 08502) is a semi-scale sailplane designed to handle a wide range of conditions from slope soaring to thermal flying. The ready-made Plura fuselage and vertical stab are pre-drilled to insure proper alignment of wings and stabilizer. The special wing retainer not only provides quick set-up, but allows the wings to pop-off in a hard landing. Pre-sheeted Siros wing panels are factory-sanded with pre-cut spoiler bays for an optional spoiler set. All necessary hardware, including push rods, guide tubes, large decal set are included.



GREAT PLANES PT-40

The Great Planes (P.O. Box 4021, Champaign, IL 61820) PT-40 offers the first-time modeler a quick, easy, and economical way to enter the world of R/C model airplanes. Construction is extremely simple with detailed step-by-step fully-illustrated instructions. The wings have balsa ribs, with preshaped and notched leading and trailing edges. the fuselage is balsa and plywood with all parts interlocking so it goes together in a breeze. The PT-40 has a wingspan of 60 inches and requires a .25-.40 2-cycle or .30-.45 4-cycle engine. Also available in a .20 size with a 52-inch wingspan. Both kits include hinges, pushrods, landing gear, and a photo-illustrated manual.

GIANT STEPS

(Continued from page 103)

model a little nose-heavy; moving the CG to the rear can alter the performance quite dramatically. Be careful here, though, as a tail-heavy model can be really squirrely. If you're going to move the CG, do it in small increments and fly the bird for several flights after each change to assure that you appreciate the change made. Here again, when it starts getting hairy, go back one step and stay there!

Wing incidence can make a model a poor flyer. If the incidence was not spelled out on the plan, or if you're not able to measure it accurately, small changes made with care can cure a sick bird. Here again, small shims placed under the leading or trailing edges of the wing(s) can improve the model's performance quite dramatically.

These and some other ideas can help make a pussy cat out of that dog you put away because it didn't fly the way you expected. Don't be afraid to try a few of these ideas. After all, if your aren't flying it because you don't like it, you can't be much worse off by making a few slight changes. And who knows, you may even become your club's expert at flight-trimming once you gain some experience.

**The following is the information pertinent to this article:*

Curtis Givens, 5304 W. Riverview, Dayton, OH 45406.

Bob Blaney, IMAA Secretary, 14 Parkview Rd., Long Valley, NJ 07853. ■

BYRON EXPO

(Continued from page 54)

a Sachs 3.7. It was a fine looking and flying airplane.

Bob Violett* and his daughter Patty put on a spectacular show of speed and maneuvers with their Viper ducted fan sport airplane. Make no mistake, this is a superperformer with all the speed and maneuverability an R/Cer could want. The sleek jet is powered by a KBV .72 on a Viojett fan unit. Paint and fuel were by K&B Mfg*. I was most impressed by Violett's flights that exhibited nearly unlimited vertical performance. If anyone still thinks fan-jets are slugs, you should have seen this bird go!

That performance was rivaled by Byron Originals own version of a sport jet, the Bullet. This airplane, usually powered by an OS .77 VFDF engine on the Byrojet fan, showed similar performance levels. Indeed, frequently the Byron Bullet and Violett Viper were displayed at the same time. They are both fine performers.

There was an interesting twist to this "battle of the sport jets." Sometime during the week, the show team Cloud Dancers, from Florida, and the Washington Sky Riders agreed to try to take a Byron Bullet from kit to flight overnight. Six modelers took on this task and, by the next morning, they had a finished, painted Bullet ready to go. It seems the Byron Bullet is as fast off the board as it is in the air!

It was a thrill to see Leon Shulman at Ida Grove. Leon holds full credentials as one of model aviation's pioneers. His Zombie free flight dominated gas events in the early days and is still competitive in OT R/C events today. Leon came to Ida Grove with his Kool Kanary (a giant scale version of Top Flite's Hot Kanary) and his flights were excellent; not at all bad for an "old guy." He also became a TV star! Leon's bird is a MAN design (#2851, Feb. 1985) powered by a Sachs 3.4 with CH electronic speed control. Kool Kanary is a fine flying quarter-scale that doesn't need a van for transport.

Speaking of "old guys," we found Elliot Berelson flying his Ziroli*-designed Fokker DR-1. Elliot does a fine flying job with his Fokker powered by a Quadra 35. I've known a lot of modelers, but I've never known a more passionate one than Elliot. He truly enjoys this hobby.

There was another airplane that really caught my eye. This proved to be Sig's* latest offering, the Spacewalker; a full-scale home-built model. This airplane flies as well as the firm's well-known Smog Hog. Indeed, it looks something like that early R/C design. It has a sleek look and should be very popular in months to come. Spacewalker is powered by an OS 240 Pegasus, has an Airtronics radio, and a 104" wing for 1800 square inches to carry its 21 pounds.

The real story comes from the fact that Maxey Hester, who flew the bird at Ida Grove, has not only built the model, but has also completed and flown the full-scale version. Not too many modelers can say that!

There was one more airplane that stood out from the rest. This one was by Paul Grubisch and was a rendition of the Pilot Bucker Jungmeister. Paul's Jungmeister could have been a MonoKote winner and, in flight, it clearly *was* a winner. The airplane weighed 18 pounds, was powered by a Bully engine, and was truly a beauty.

Jet sessions seemed, in great measure, to be a Byron convention with loads of that firm's products in attendance. There were F-16s, A-4s, and F-15s. The F-15 with its twin Byrojet fans was a super performer and this was amply demonstrated when the Clound Dancers show team put on their act.

Another fine flying jet was Byron's version of the BD-5J with OS 77 power. The 40 percent BD figured in a neat little story. At this Expo, Dave Hoover flew his full-size (and that's really small with only a 17 foot wing—compare that to Byron's "model" B-29 with a 28 foot wing) BD-5J in Coors Light colors. His performance was truly spectacular; that sucker is fast and capable of any maneuver. Hoover was not the least bit shy to put the Silver Bullet right on the deck. The semi-monocoque, all-aluminum jet is powered by an Ames Microturbo putting out 200 pounds of thrust. The airplane stalls at 67 mph and hits a max of 285 mph. It's truly an airplane tht must be seen to be believed.

Just as unbelievable, Dave Hoover also flew the 40 percent scale Byron BD-5J painted just like his full-size one. This was his very first R/C flight! Not so surprising you say.

Well, it has been my experience that the worst, first-time R/C pilots are those that have extensive full-scale flight experience. I believe this stems principally from the lack of direct aircraft orientation. They have problems creating control inputs to an airplane while standing on the ground (they need that cockpit feel), and the lack of orientation seems harder for a full-size pilot to handle. Novice or big plane pilots face the same problems, but eventually we all overcome them.

Dave Hoover overcame it in one flight. While he was not as capable with the model as with his big (?) one, he didn't crash it, and his pattern was really quite smooth. It was a testimony to Hoover's natural skills and Byron's BD-5J flying characteristics. This is a fine flying fan jet and it gave me a real kick seeing a first time flyer handle it.

After each day of model flying, the Byron Aviation Expo airshow took over the Ida Grove modeling facility for two hours. It was an action-packed two hours that every modeler or aviation buff must someday see.

The show started each day with the Eagles (now co-sponsored by Byron Originals) escorting the skydivers down to earth. The noise of the eagles alerted all in attendance as their circling created a symphony of power and sound. The opening was followed by the Cloud Dancers.

I have often said one of AMA's best PR moves was the creation and support of the many show teams. Industry has supported the show team movement as

(Continued on page 122)

NAME THE PLANE CONTEST

Can you identify this aircraft?

If so, send your answer to Model Airplane News, Name the Plane Contest (state issue in which plane appeared), 632 Danbury Rd., Wilton, CT 06897.

Congratulations to Earl Lock of Tallmadge, OH, for correctly identifying the Bell X-14 in our October issue. His name was drawn from the 17 correct answers received, including one from Edward G. Frantz of Buffalo, NY, who was on the original ground crew!!

The Bell X-14 was a VTOL airplane ordered by the Air Force on a contract awarded in May of 1956. Its first successful hovering flight took place in February of 1957, seven short months later! Power was originally provided by a pair of British Armstrong Siddeley Viper engines using thrust vectoring nozzles for VTOL capability. These were eventually replaced by higher-output J-85s. It was damaged during a hard landing in May of 1981 and is presently located at NASA Ames Research Center, Palo Alto, CA. ■

The winner will be drawn four weeks following publication from correct answers received by postcard delivered by U.S. Mail and will receive a free one-year subscription to Model Airplane News. If already a subscriber, the winner will receive a free one-year extension of his subscription.

Club of the Month

One of the most unusual names we've seen for an R/C club is that of the Porcupine Aero Modellers Club of northern Ontario, Canada. The appellation stems from their flying field location in Porcupine, Ontario, near the Porcupine River, not from the prickly animal who may or may not reside in the area. In any event, we won't "needle" them about their name!

And "needle" them we won't, since this club is doing all sorts of things for their members, as well as advancing R/C's image with the public. According to Rick Bacvar, P.A.A. Vice President, the club has, since October '86, had: regular monthly meetings; a bi-monthly newsletter (Porcupine Propwash, edited by John Kita); a large model aircraft display at a Sportsman Show for 11,000 spectators; a half-hour local TV talk program; a shopping mall display; participation in Air Show '87 at Timmin's Airport; new club jackets; a four stroke seminar for all members (not a bad idea for any club); new grass flying field; an increase in membership from 18 to 37; new member flight training; newsletter contests; recognition of Jack Moisley and his half century of modeling and an informational hand-out club sheet. Quite a list of effort and achievement.

The club newsletter is breezy and informative. Frankly, if we lived near Timmins, Ontario, we would surely join this club. They are very organized and a credit to Canadian R/Cing. President Dwight Smith can be very proud!

We at *Model Airplane News* wish the Porcupines the best in all their future activities, and we are pleased to award two free one-year subscriptions, to be given by them to worthy members.

Congratulations! ■

Each month Model Airplane News will select the club newsletter that best shows the club's activities and energies directed toward the furtherance of the hobby. The award is not based on size or quality of the newsletter, and can be about any aspect of the hobby (F/F, C/L, R/C, boating, cars, etc.). Model Airplane News will award two free one-year subscriptions to be given by the club to outstanding junior members. So send your newsletter to Model Airplane News, Club of the Month Contest, 632 Danbury Rd., Wilton, CT 06897.

BYRON EXPO

(Continued from page 115)

evidenced by Byron who sponsors the Cloud Dancers. That team is one of the best, and the group has entertained at numerous venues to raise funds for worthy causes or simply to show model aviation in its best possible light.

Their act includes an R/C-controlled group of skydivers jumping six-at-a-time from their "almost-out-of-scale-Island-Normander" (a mainly cardboard airplane that has a landing style hard to believe), the Flying Machine (a 40 powered free-style airplane that boggles one's mind), and formation flying of Byron F-15s.

I've watched attempts at model formation flying for years. I've even spent some time trying it myself. I have never really seen precise results. In fact, most model formation flying appears as if the participants have never been introduced. Not so with the Cloud Dancers. They put on a real show with two F-15s (I understand there are three sometimes) that was great.The act included head-on passes, dirty/clean passes, side-by-side flight, and formation maneuvers. One thing is certain, the Cloud Dancers demonstrated the power and fine flight qualities of the Byron F-15.

For me, the most spectacular segment of the Cloud Dancers' performance was Don Muddiman and the Flying Machine. I have great respect for any top notch pattern flyer or world class flyer. I understand and admire the discipline those sports require. But, I have always been impressed with creative R/Cers that take on an R/C airplane and choreograph a flight as if it were a dance; a flyer that keeps his airplane on the "edge," painting pictures as a painter would with his brush. For twenty years, the best I've seen at this type of free-style flying were Ted White and "Jersey" Jim Martin.

Well guys, move over for a new free-style "top gun", the aforementioned Don Muddiman. Don's flights with the Flying Machine defy description. Try a landing approach from 400 feet in a vertical dive with a three foot pull-out followed by a series of rolls and loops to a landing at Don's feet! The Flying Machine is a super, fun-fly airplane.

After the Cloud Dancers finished, the Coors Light Silver Bullet and its high-speed ballet, literally set to music, took over. An interesting twist to this was a direct link to the cockpit; not only did you see the maneuvers, Dave Hoover told you how they felt. Bullet was follwed by the Eagles that you all know so well. They get better every year. There were some warbird demos that included a P-51, Corsair, and B-25 along with others. The warbirds always exact warm feelings from modelers; those at Aviation Expo were no exception.

And, 1988 is just around the corner. If you can find a way to Ida Grove in August (10-14) next year, do so. This writer can guarantee you'll have a modeling experience found no place else in this world. Aviation Expo '88 will surely be a classic. I plan to be there and I hope you will be as well.

**The following are the addresses of the manufacturers mentioned in this article:*

Byron Originals, P.O. Box 279, Ida Grove, IA 51544.

Bob Violett Models, 1373 Artres Road, Winter Spring, FL 32708.

K&B Manufacturing, 12152 Woodruff Ave., Downey, CA 90241.

Nick Ziroli Models, 29 Edgar drive, Smithtown, NY 11787.

Sig Manufacturing Company, Inc., 401 S. Front Street, Montezuma, IA 50171. ■

ADVERTISER INDEX
DECEMBER 1987

Classified

RAZOR BLADES: Single-edge industrial quality, super sharp. 100/$4.75, 200/$9.50, 300/$14.25, 500/$23.50, 1,000/$46.00; add 10% postage west of the Mississippi. Cobbie's Gifts, Box 2, Deal, NJ 07723; 201-922-9898.

WANTED: RTF U-Control planes from Cox, Wen-Mac, Comet, Aurora, Testors, etc., complete or pieces, buy or trade. John Fietze, P.O. Box 593, Lynbrook, NY 11563.

ANTIQUE MODEL IGNITION ENGINES—PARTS CATALOG, 50 pages, precision cast timers, original cylinder heads, point sets, drive washers, tanks, for GHQ, O&R, O.K., many others. Large catalog $4.00 pp. Chris Rossbach, RD 1, Queensboro Manor, Gloversville, NY 12078.

HARDWARE AND SOCKET HEAD cap screws, all sizes, low prices. Write for complete list. Example 6-32x1" only $4.25 per hundred. Micro Fasteners, P.O. Box 42A, Netcong, NJ 07857.

WANTED: Model airplane engines and model race cars made before 1950. Jim Clem, 1201 E. 10, P.O. Box 524, Sand Springs, OK 74063; 918-245-3649.

BEGINNERS, discouraged by too-fast R/C "trainers"? Send $1 and a stamp for no-holds-barred evaluation of over 20 well-known models rated for their ease-of-flying. James Waterman, 3818 Deerfield Dr., San Antonio, TX 78218.

SCALE DOCUMENTATION: PLAN ENLARGING. Photo packs, 3-views, drawings for 1,600 aircraft. Super-scale R/C plans for Giant, Sport; 43-page catalog $3. Scale Plans and Photo Service, 3209 Madison Ave., Greensboro, NC 27403; 919-292-5239.

ENGINE COLLECTORS: Spark ignition and old diesels for sale. Riccardo Taccani, CP59, 6834 Morbio INF Switzerland.

WANTED: Model engines made before 1950. Don Blackburn, P.O. Box 15143, Amarillo, TX 79105; 806-622-1657.

WANTED: Kits (circa '50 and '60s) from Berkeley, Babcock, deBolt, Veco (U/C and R/C), Monogram (Speedee-Bilts), Scientific. Dr. Frank Iacobellis, 19 Highland Park Place, Rye, NY 10580; 914-967-7763.

WANTED: GERMAN DIESEL (e.g. Taifun, Webra, Jaguar) or early glow engines (e.g. Webra Big Ben 5cc, Webra Sport Glo A956), only new or NIB. Also German free flight and early R/C-kits. Will pay fair prices. Dr. W. Sturn, JM Strasser Feld 29, D-512 Herzogenrath, W. Germany; 2406-5952.

NO. 11 CRAFT/HOBBY BLADES. Premium quality cabon steel, made in USA. 100 pack, $8.95 delivered. Berkeley trading Co. Dept. AA, P.O. Box 26, Berkeley Springs, WV 25411.

WANTED: Du-Bro Shark Helicopter Collective Pitch Head. Call in AM, Carl Defilippo, 905 Main St., Winchester, MA 01890; 617-729-2877.

ASTRO FLIGHT Cobalt 05 Systems swap for Fox Eagle III or Fox 45 with Diesel Heads. Jim DeSpirito, 3863 Wrightsbord Rd. #4, Augusta, GA 30909.

WANTED: US Company seeks supplier of high quality wood propellers in quantity. Mark Jamieson, 2390 Portland St. #207, Los Angeles, CA 90007.

FOR SALE *M.A.N.* and *Flying Models* 1980-87. Send SASE for list: F. Dunson, 1512 Waite Av., Toledo, OH 43607.

1986 SCALE MASTERS CHAMPIONSHIP on videotape. Edited and narrated footage features 42 aircraft as well a the trophy awards. Running time: 60 minutes. $29.95 postpaid. MasterCard and Visa welcome. Specify beta or VHS. To order call 702-731-5217 after 5 p.m. Pacific time or write Werner Kopp, 2973 Berman, Las Vegas, NV 89109. No COD's please.

P-40 WARHAWK memoribilia canopy crank with curtiss/right tag attached $55.00. Bob Spencer 5833 Red Bank, Galena, OH 43021; 614-965-4931.

R/C BEGINNERS discouraged by too-fast "trainers"? "Trainer Ease-Of-Flying Ratings," $1.00 plus two stamps. Jim Waterman, 3818 Deerfield Dr., San Antonio, TX 78218.

BOOKS FOR MODELERS. Out-of-print/current, 400+ items list $1. John Roby, 3703B Nassau, San Diego, CA 92115.

FOR SALE: *Model Airplane News, Flying Aces,* 1934-1960, others, $1 for list. Bruce Thompson, 328 St. Germain Ave., Toronto, Ontario, Canada M5M 1W3.

FREE AVIATION RESEARCHERS'S BOOK CATALOG: Fully indexed. 1001 entries. Send for your copy today. Greiner Associates, 16-4N Mistuxet, Mystic, CT 06355.

BUILD AND MAINTAIN YOUR OWN ELECTRONICS. Battery cycler, constant current charger, digital ESV, etc. Radio Shack parts. Very complete instructions for the non-electronics person. Satisfaction guaranteed. Business size SASE for information. Lico Electronics, 700 NW 7th Ave., Boca Raton, FL 33486.

BUILDING BOARDS: Flat, warp-resistant, pennable building surface; 16 inches wide, 48 inches long. Free brochure. Limestone Enterprises, Box 586-MA, Athens, AL 35611.

WANTED: Berkeley and Cleveland kits. Will also consider parts, plans, boxes, brochures, radio equipment, accessories, etc. Gordon Blume, 4649 191st Ave. SE, Issaquah, WA 98027.

QSAA 1986 LAS VEGAS FLY-IN on videotape. Edited footage features over 60 aircraft. Running time: 40 minutes. $24.95 postpaid. Mastercard and Visa welcome. Specify Beta or VHS. To order call (702) 731-5217 after 6 p.m. Pacific time, or write Werner Kopp, 2973 Berman, Las Vegas, NV 89109. No COD's please.

J.R. UNLIMITED: Eight radios with 4 servos on 6 meters—$220.00. Dr. E.B. Hurt, 6214 Highgate, Dallas, TX 75214; 214-692-0690.

AFFORDABLE SPEED CONTROLS. Three models to choose from with MOSFET technology. The forward EKE-24C, handles 1 to 24 cells, $25.00 kit, $39.95 assembled. The reversing EKE-7R handles 4 to 7 cells, $30.00 kit, $46.95 assembled. The EKE-7RM, mini version of the EKE-7R. $32.00 kit, $48.95 assembled. All speed controls come without connectors and enclosures. Send S.A.S.E. for more information; add $2.00 for postage & handling per order. Write to ELDENKEN ELECTRONICS P.O. Box 1853 Arvada, Colorado 80001.

WILL BUILD YOUR R.C. or control-like planes, your kit or plans or mine. 40 years experience. Guaranteed. Clemans Aircraft, 440 Old Stge Way, Yakima, WA 98908.

MAGAZINES FOR SALE: *Model Airplane News, RCM, American Modeller, Popular Aviation, Air Classics, Air World, Scale Modeller* and more. Many back to the 1930's. Excellent to mint condition. Send SASE for list of titles and any inquiries to: Mrs. Carolyn Gierke, 1276 Ransom Road, Lancaster, NY 14086. 716-681-4840.

BRAINSTORMERS WANTED: Send SASE. Business and Invention, 1284A, West Crescent, Redlands, CA 92373.

Send ad and payment to *Model Airplane News,* 632 Danbury Rd., Wilton, CT 06897. **Non-Commercial classified ads** (commercial ads of any kind not accepted at this special rate). Rate: 15 words or less, $4.50 payable in advance. No charge for name and address. Additional words, 25¢ each. **Commercial classified ads** (rate applies to anyone selling on a commercial basis—retailers, manufacturers, etc.). Rate: 50¢ per word, payable in advance. Count all initials, numbers, name, address, city and state, zip and phone number. **Closing Date** for either type of ad is the 15th of the third preceding month (for example, January 15th for the April issue). We do not furnish box numbers. If you would like your ad to run in more than one issue, multiply amount of payment by number of months that ad is to run. It is not our policy to send sample copies or tear sheets.